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Feeding Different Types of Feed on Vannamei Shrimp (*Litopenaeus vannamei*) Maintaining with Low Salinity Media

Pemberian Jenis Pakan Yang Berbeda Pada Pemeliharaan Udang Vannamei (*Litopenaeus vannamei*) Dengan Media Bersalinitas Rendah

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ABSTRACT

This study aims to determine the effect of giving different types of feed to the value of Specific Growth Rate (SGR), Feed Conversion Ratio (FCR), and Survival (SR) vannamei shrimp (Litopenaenus vannamei) in the maintenance of media with 2 ppt salinity. The research method used is an experimental method using a Completely Randomized Design (CRD) consisting of 3 treatments and each repeated 4 times. The first (P1), second (P2), and third (P3) treatments were rearing vannamei shrimp with pelleted feed, natural feed for silk worms (Tubifex tubifex), and a combination of the two. The results showed that the provision of different types of feed gave a significant effect on the value of the Specific Growth Rate (SGR) of vannamei shrimp. Feeding a combination of silk worms (Tubifex tubifex) and pelleted feed was the best treatment with an SGR value of 6.07% BW/day. The treatment given in this study did not have a significant effect on the FCR and SR values. The results of observations of water quality during this study included the value of the degree of acidity (pH) which ranged from 6.6 to 6.8, then the temperature ranged from 24.3 -24.5 oC, the salinity was homogeneous, which was 2 ppt, and dissolved oxygen (DO) which ranged from 6.8 to 7.3 mg/l.

ABSTRAK

Penelitian ini bertujuan untuk mengetahui pengaruh pemberian jenis pakan yang berbeda terhadap nilai Laju Pertumbuhan Spesifik (SGR), Rasio Konversi Pakan (FCR), dan Sintasan (SR) udang vannamei *(Litopenaenus vannamei)* pada pemeliharaan media bersalinitas 2 ppt. Metode penelitian yang digunakan adalah metode eksperimen dengan menggunakan Rancangan Acak Lengkap (RAL) yang terdiri dari 3 perlakuan dan masing-masing diulang 4 kali. Perlakuan pertama (P1), kedua (P2), dan ketiga (P3) berturut turut adalah pemeliharaan udang vannamei dengan pemberian pakan jenis pellet, pakan alami jenis cacing sutra (*Tubifex tubifex*), dan kombinasi antara keduanya. Hasil penelitian menunjukkan bahwa pemberian jenis pakan yang berbeda, memberikan pengaruh yang nyata terhadap nilai Laju Pertumbuhan Spesifik (SGR) udang vannamei. Pemberian pakan kombinasi antara cacing sutra (*Tubifex tubifex*)dengan pakan pellet, merupakan perlakuan yang terbaik dengan nilai SGR sebesar 6,07% BW/hari. Perlakuan yang

diberikan pada penelitian ini tidak memberikan pengaruh yang nyata terhadap nilai FCR dan SR. Hasil pengamatan kualitas air selama penelitian ini meliputi nilai derajat keasaman (pH) yang berkisar antara 6,6 – 6,8, kemudian suhu yang berkisar antara 24,3 -24,5 ^{o}C, salinitas yang bernilai homogen, yaitu 2 ppt, dan kandungan oksigen terlarut (DO) yang berkisar antara 6,8 – 7,3 mg/l.

Kata Kunci	*Pakan, Udang vannamei, Litopenaeus vannamei, Laju Pertumbuhan Spesifik, Rasio Konversi Pakan, Sintasan*
Key words	*Feed, white Shrimp, Litopenaeus vannamei, Specific Growth Rate, Feed Convertion Ratio, Survival Rate*
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INTRODUCTION

Vannamei shrimp (*Litopenaeus vannamei*) is a euryhaline aquatic organism, namely an organism that has tolerance to a high salinity range, namely between 2 - 40 ppt, making it possible to cultivate it in freshwater, brackish and marine environments (Wyban et al., 1991) .

In the vannamei shrimp rearing business, feed is one of the most important elements that supports the growth and survival of the vannamei shrimp. Feed is the largest variable cost (non-fixed cost) of production costs, which is around 50-70%. Wibowo (2006) said that around 60% of the variable costs in the vannamei shrimp cultivation business come from feed, while around 40% is the cost of procuring fry (10%) and other fishery production facilities (30%). Therefore, selecting the right type of feed is highly recommended in order to support optimum success in the vannamei shrimp cultivation business.

Silk worms (Tubifex tubifex) are natural food for freshwater fish which contain a high protein value, namely 48%. This value is above the minimum requirement for vannamei shrimp for enlargement, which is 30%, so that in the freshwater vannamei shrimp cultivation business, providing silk worms as natural food can be recommended. Natural feed for this type of silk worm can also be combined with artificial feed in the form of shrimp pellets which have better economic value compared to silk worms. Until now there has been no research on choosing the right type of feed when rearing vannamei shrimp in fresh water media. This then became a reference for a scientific study regarding the provision of different types of feed when rearing vannamei shrimp (*Litopenaeus vannamei*) in low salinity media.

This research aims to determine the effect of giving pellet feed, natural feed of the Tubifex tubifex type, as well as a combination of commercial pellet feed with natural feed of the Tubifex tubifex type on the values of Specific Growth Rate (SGR), Feed Conversion Ratio (FCR), and Survival (SR) of shrimp. vannamei (*Litopenaeus vannamei*) salinity 2 ppt. It is hoped that the results of this research can be used as a source of knowledge and information for the public, especially freshwater vannamei shrimp cultivators, regarding selecting the right type of feed to support the success of the freshwater vannamei shrimp cultivation business.

METHODS

Tools and materials

The tools used in this research include: 12 aquariums measuring (30 cm x 30 cm x 30 cm), aerators and equipment, refractometers to measure salt levels, DO meters to measure dissolved oxygen and water temperature, pH pen to measure pH, siphon hose, scop net (seser), etc.

The material used in this research included 25 day old post larvae (PL) of vannamei shrimp (Litopenaeus vannamei) (PL 25) obtained from the PT Hatchery. Summa Benur is located in Situbondo Regency – East Java. The feed used is natural feed of the Tubifex sp type and artificial feed in the form of commercial rooster brand pellets. The nutritional content of the two types of feed can be seen in Table 1 below:

Table 1. Nutrient content of feed used in research

Treatment	PARAMETER					
	Ash Content	Crude protein	Crude Fat	Crude Fiber	BETN	Calcium (Ca)
P1	15	30	10	17	23	2.6
P2	1,28	7,78	2,58	0,94	5,07	0
P3	8,14	18,89	6,29	8,97	14,04	1,3
Satuan	%	%	%	%	%	%
Metode Uji	*AOAC70*	*AOAC70*	*AOAC70*	*AOAC70*	*Haris et al., (1972)*	*AOAC70*

Information: P1 = Pellet feed
P2 = Silk worm feed after conversion from dry to wet
P3 = Combination of pellets with silk worms (*Tubifex tubifex*)

Method

The method used in this research is the experimental method. The experimental method was carried out to test the effect of providing different types of feed on the growth of vannamei shrimp (*Litopenaeus vannamei*). The experimental design carried out in this research was a Completely Randomized Design (CRD).

Treatment

The treatment given in this research was as follows:
P1: Pellet feed
P2: Natural food of silk worms (*Tubifex tubifex*)
P3: Combination feed (artificial feed + natural feed)

Research procedure

Aquarium Preparation.

The vannamei shrimp rearing container used for this research was an aquarium measuring 40 x 30 x 30 cm. Aquarium preparation includes cleaning, then arranging the aquarium according to the research plan, adjusting the aeration so that each aquarium

has one aeration hose, then filling 12 liters of mixed fresh and sea water with a salinity of 2 ppt.

Feed Preparation.

Pellet feed used in the research was obtained from purchases from commercial feed companies in quantities that meet the needs during shrimp rearing. Natural food used by silk worms (*Tubifex tubifex*) obtained from one of the fish markets in Malang City.
Preparation of Vannamei Shrimp Seeds

Vannamei shrimp seeds were obtained from PT. Summa Benur Situbondo, with Post Larva stage 12 days old (PL 12), with salinity conditions of 30 ppt. Then acclimatized directly to a salinity of 5 ppt on the first day. Then on the fourth day, the salinity was reduced to 4 ppt, then fell again to 3 ppt on the sixth day. On the eighth day, the salinity was reduced again to 2 ppt. After reaching a salinity of 2 ppt, the vannamei shrimp fry are ready to be spread into the aquarium to start research activities. Scabra et al., (2021), stated that the vannamei shrimp acclimatization model from high salinity media to low salinity media can be carried out in a fast or slow period of time. The SR value of vannamei shrimp reared for 14 days after acclimatization, which took 1 day and 4 days, did not show a significant difference in value.

Implementation

1. Prepare the aquarium and place it according to the research plan.
2. Prepare and insert aeration equipment in the aquarium.
3. Fill the aquarium with media water according to the desired salinity to a height of 22 cm in the aquarium body.
4. Leave the maintenance media water for one day with active aeration conditions.
5. Weighed 25 37 day old vannemi shrimp (PL 25) then put them into the aquarium maintenance container.
6. Weighed 25 37 day old vannemi shrimp (PL 25) then put them into the aquarium maintenance container.
7. Provide food with a frequency of 4 times a day with the type of food adapted to the treatment of each aquarium.
8. The water is changed every 3 days, and every day the siphon is removed to remove dirt and leftover food, and the water is added according to the initial volume of the aquarium because the water decreases during the siphon.
9. Carry out water quality measurements including salinity, temperature, dissolved oxygen (DO), and water pH every day during the research period.
10. Collecting main parameter data, namely specific growth rate (SGR), Feed Conversion Ratio (FCR), and Survival (SR) every week on a regular basis during the research period.
11. Then proceed with analysis of research data.

Test Parameters

Main Parameters

1. Growth

The growth in question is the specific growth rate (SGR) which is measured by calculating the body weight of the shrimp in each treatment, and taking the average value expressed in grams. Shrimp weight was measured once a week from the start of the study to the end of the study. The measurement results are then entered into a formula as follows (Zonneveld, 1991):

$$SGR = \frac{Ln\ Wt - Ln\ Wo}{t} X\ 100\%$$

Information:
SGR = Specific Growth Rate; Wt = Average weight of fry on t (mg); Wo = Average initial weight of fry (mg); t = number of days during the experiment.

2. Feed Conversion Ratio

Feeding ratio (FCR) is a comparison between the amount of feed given and the increase in weight of the fish being kept (Rizkiardiansyah, 2008). The formula for calculating the feeding ratio can be as follows:

$$FCR = \frac{\Sigma \text{ feed given}}{Wt - Wo}$$

Informstion :
FCR = Feed Convertion Ratio; Wt = Final average weight (g); Wo = Initial average weight (g)

3. Survival (SR)

According to Effendie (1997), the survival rate is the ratio of the number of fish/shrimp that were alive at the end and beginning of the study. The formula used is as follows;

$$SR = \frac{Nt}{No} X\ 100\%$$

Information ;
SR = Survival Rate ; Nt = Number of shrimp at the end of the study; No = Number of shrimp at the start of the study

Supporting Parameters

The supporting parameters measured in this research are the water quality conditions of the maintenance media, namely temperature, DO, pH and salinity. Temperature (0C) is measured using a thermometer. Dissolved oxygen (mg/liter) is measured using a DO meter (Scabra & Budiardi, 2020). pH (degree of acidity) is measured using a pH pen / litmus paper. Salinity is measured using a refractometer *(Scabra & Budiardi, 2019)*.

Data Analysis

To determine the effect of treatment (independent variable) on the response of the measured parameters (dependent variable) analysis of variance (ANOVA) or F test is used, with 95% to 99% confidence. If the variance test shows results that are very significantly different or significantly different, then proceed with the Difference test to find out which treatment gives the best results.

RESULT AND DISCUSSION

Specific Growth Rate (SGR)

Observations of specific growth rate values are carried out routinely every week based on the weight calculation of vannamei shrimp. The formula used is to subtract the weight of the shrimp at the end of the study from the weight of the shrimp at the start of

the study divided by the total research time. The results of calculating the Specific Growth Rate of vannamei shrimp can be seen in the table 2;

Table 2. Specific growth rate (SGR) of vannamei shrimp (Litopenaeus vannamei) during the study

Treatment	Test				Total	Average
	1	2	3	4		
P 1 (Pellet)	4.42	6.42	5.41	5.18	21.43	5.36±0.824
P 2 (Tubifex sp.)	5.50	5.75	2.76	4.23	18.24	4.56±1.371
P 3 (Combination)	5.78	5.91	6.26	6.33	24.28	6.07±0,269
Total					63.95	5.33±0.551

The highest specific growth rate value was shown by P3, namely rearing of vannamei shrimp fry with a combination feeding treatment of silk worms with commercial pellets, namely 6.07% BW/day, which was then followed by P1, namely rearing of vannamei shrimp fry with the commercial shrimp pellet feeding treatment was 5.36% BW/day, and the lowest value was shown by P2, namely rearing vannamei shrimp fry using silk worm feeding treatment with a value of 4.56% BW/day.

The differences in specific growth rate values for each research treatment were caused by several factors, including the existence of proximate specifications for the type of feed used so that each type of feed had different contents. Apart from the different contents, each type of feed used in the research also has its own characteristics and traits, so the way shrimp eat this type of feed must adapt to the nature and characteristics of the feed given. Then, the water quality value in the shrimp rearing container also greatly influences the specific growth rate. If the water quality in the rearing container is good and in accordance with the living standards of the shrimp, then the growth of the shrimp will be good too, and vice versa.

The treatment that provides the best specific growth rate value is the P3 treatment, namely feeding a combination of silk worms (*Tubifex tubifex*) with commercial pellet feed. The combination treatment between the two types of feed provides its own advantages, namely the advantages of each feed specification, namely silk worms and commercial pellets. The combination of commercial pellet type feed with silk worms is like a reciprocal relationship that covers each other's shortcomings with advantages that suit the character of each type of feed.

Silk worms (*Tubifex tubifex*) are a natural food that is very commonly used in fish (shrimp) cultivation and do not damage the quality of the water as a medium for raising fish (shrimp). This happens because silk worms that are not eaten by fish (shrimp) will not cause piles of organic material at the bottom of the water. Silk worms will stay alive until the fish (shrimp) eat them again. Then vannamei shrimp always consume silk worms (*Tubifex tubifex*) alive and fresh so that their nutritional content is maintained and can be optimally converted into energy.

According to Yahya (2012), silk worms (*Tubifex tubifex*) are a natural food that has thin cell walls, making it easier for the digestive process in the intestines of vannamei shrimp that eat them. One of the criteria for good natural food for fish (shrimp) is that it is easy to digest, and the level of cell wall thickness of this type of natural food affects the

digestive process of the fish (shrimp) that eat it (Lestari et al., 2018). The thicker the cell walls of a natural food, the more difficult it will be for the natural food to be digested in the intestinal walls of the fish (shrimp) that eat it, and vice versa.

Silk worms also have weaknesses which are the nature and character of the silk worm itself. Silk worms live in colonies, so they often accumulate at certain points in vannamei shrimp rearing containers. This causes the silk worm food to not be distributed evenly throughout the columns of the rearing container.

Silk worms in dry condition have a protein content of 59%, but after being converted to wet form, the protein content in silk worms is only 7%. It is necessary to convert the proximate value of silk worms from dry to wet because the proximate test for silk worms in the laboratory is in dry conditions, while the silk worms given for consumption by reared vannamei shrimp are in wet conditions. Then, the protein content resulting from the conversion of dry to wet silk worms, namely 7%, is a very small protein content and does not match the minimum requirement for vannamei shrimp for protein, namely 30% (Tacon, 1987). Apart from protein, the other nutritional content of wet silk worms is also low, including fat, crude fiber and BETN.

Silk worms (*Tubifex tubifex*), are a natural food that has the characteristic of living in colonies. This is one of the weaknesses of silk worms as natural food for fish (shrimp). The colonial life of silk worms causes their distribution to be uneven throughout the columns of the rearing container. The impact is that the vannamei shrimp that are kept in the aquarium container consume silk worms unevenly per individual, only a few vannamei shrimp that happen to be at the point or spot where the silk worms colonize are more likely to consume silk worms in greater quantities.

In P3, namely rearing vannamei shrimp with a combination feeding treatment of commercial pellet feed with silk worms (*Tubifex tubifex*), the weaknesses found in silk worms as explained above, can then be balanced with the advantages found in the pellet feed type. commercial as a combination. Commercial pellet feed has quite good nutritional content and can meet the standard needs of vannamei shrimp. In addition, commercial pellet feed is passive and spreads evenly throughout the column of the vannamei shrimp rearing container.

As explained above, silk worms in wet conditions have very low nutritional value. The lack of nutritional intake through consuming silk worms can be met by consuming commercial pellet type feed. This is because commercial pellet feed has a high nutritional content and is sufficient to meet the needs of vannamei shrimp in carrying out their biological activities. Apart from that, commercial pellet feed also contains minerals in the form of calcium (Ca) which are not found in silk worms. According to Amri et al (2008), minerals are needed by shrimp to carry out the moulting process, and the moulting process is a phase or process for shrimp to grow.

Commercial pellet feed is an artificial feed that is passive and relatively spreads throughout the column of the vannamei shrimp rearing container. This is an advantage of pelleted feed and can cover the shortcomings of silk worms which tend to live in colonies and gather at one point in the column of the vannamei shrimp rearing container. Silk worms that have just been put into the vannamei shrimp rearing container will spread evenly, then the silk worms that have not been eaten will form a colony a few moments later. This colony causes an uneven distribution of food in the vannamei shrimp rearing container. However, by providing pellet feed as a combination, the columns in the vannamei shrimp rearing container allow for more even feed availability so that each individual vannamei shrimp that is reared can eat until they are full with the same portion.

Commercial pellet feed, apart from having advantages and characteristics, also has disadvantages which become obstacles in the process of rearing vannamei shrimp. The pellet feed used in the research has a diameter that adapts to the size of the mouth opening of the shrimp being kept, namely ± 1-2 mm. The size of the pellets is quite small so they are very susceptible to melting when mixed with water in the vannamei shrimp rearing container. This was then added to by the unstable water conditions because there was strong enough aeration so that the water in the vannamei shrimp rearing container was continuously stirred. This frequent melting of pellet feed then causes a reduction in the amount of food available for vannamei shrimp. However, by feeding silk worms as a combination of pellet feed in the third treatment (P3) of the study, the shortage in the amount of feed in the form of pellets can be covered by the availability of feed in the form of silk worms.

The first treatment (P1) is a treatment with a specific growth rate (SGR) value below P3, namely 5.36% BW/day. In contrast to treatment P3, P1 is a treatment that involves only one type of feed. This causes the nature and character of the feed to be the only factor in terms of feed that supports the growth of vannamei shrimp reared during the research period.

As previously explained, the commercial pellet type feed used in research has certain advantages and disadvantages. The advantages of this type of pelleted feed are its own advantages in rearing vannamei shrimp. Likewise, vice versa, the weaknesses contained in the feed can become a disadvantage or obstacle in itself. These weaknesses then cause the specific growth rate value in P1 to not be optimal and is below the specific growth rate (SGR) value in P3.

Commercial pellet feed is a type of feed in the form of small crumbs, making it susceptible to melting of the pellet feed if it is mixed with water in the vannamei shrimp rearing container. The destruction of pelleted feed can have negative impacts, including reducing the supply of food in the form of pellets themselves. Apart from that, melting of pellet feed in water can also damage the quality of the water by causing excessive turbidity. The turbidity caused by fragments of pelleted feed then has the potential to become a pile of organic material that continues to accumulate and can damage water quality through the decay process. The decomposition of this organic material has the potential to produce ammonia (NH) compounds which are toxic (poison) so that they can inhibit the growth rate of reared vannamei shrimp.

In contrast to P3, the amount of pellet feed given to the P1 vannamei shrimp rearing container was up to 2 times greater. This is because in P1, the feed given is only in the form of pellets, while in P3, pellet feed is only given in half a portion which is then combined with natural food in the form of silk worms (*Tubifex tubifex*). The amount of pellet feed given to the vannamei shrimp rearing container is a relationship that is directly proportional to the level of water quality pollution in the vannamei shrimp rearing container. The greater the amount of pelleted feed given, the more turbid the waters in the rearing container, so the greater the potential for rot to occur which produces ammonia (NH) compounds which are toxic to the growth of the reared vannamei shrimp. This then becomes the main factor, why the growth of vannamei shrimp is better when given P3 than P1.

The treatment that gave the lowest specific growth rate value was P2, which was 4.56% BW/day. The natural feed for this type of silk worm has several weaknesses that cannot be covered, resulting in a low value of the specific growth rate of vannamei shrimp. These weaknesses include its low nutritional content and its colonial nature.

The silk worms used in the research were silk worms in wet conditions (alive). Then, from the results of the proximate analysis of silk worms in dry conditions, values for the nutritional content of the silk worms were obtained. The value of the proximate analysis results is then converted into wet silk worms by multiplying the proximate value of the dry silk worm by the dry weight (BK) value of the silk worm. The conversion results can then be seen in Table 1 regarding the nutritional content of the feed used during the research. The nutritional content of wet silk worms is very small and does not meet the basic needs of vannamei shrimp. For example, the protein content value for wet silk worms is 7.78%, whereas according to Tacon (1987), vannamei shrimp during their growth period require a minimum of 30% protein. The lack of nutritional content in silk worms then becomes the main factor, why P2 is the treatment that produces the lowest specific growth rate (SGR) value.

Statistical calculations were then carried out to determine the effect of providing different types of feed on the specific growth rate value of vannemi shrimp. Based on the results of variance analysis, providing different types of feed has a real effect. on the specific growth rate of vannamei shrimp fry during the research period. This shows that hypothesis 0 (H0) can be rejected and then accept hypothesis 1 (H1) which states that, it is suspected that different types of feed/rations that were tested on vannamei shrimp with a salinity of 2 ppt provided different growth for vannamei shrimp.

To determine the differences between each treatment and to determine the treatment that provides the best specific growth rate (SGR) value for vannamei shrimp fry (Litopenaeus vannamei), a different test was carried out. The results of the difference test show that P1 is not significantly different from P2, P1 is not significantly different from P3, and P3 is significantly different from P2. This shows that P3 provides the best results to support the specific growth rate of vannamei shrimp, namely 6.07% BW/day.

Feed Conversion Ratio (FCR)

Feeding ratio (FCR) is a comparison between the amount of feed given and the increase in weight of the fish being kept (Rizkiardiansyah, 2008). This means that the lower the value of a feed conversion ratio, the better it will be in terms of feeding efficiency. Based on observations made during the research period, data was generated regarding the feed conversion ratio of vannamei shrimp fry during the research period, as shown in Table 3;

Tabel 3. Feed conversion ratio (FCR) of vannamei shrimp fry (*Litopenaeus vannamei*)

Treatment	Treatment				Test	Total
	1	2	3	4		
P1 (pelleted feed)	7.84	4.90	5.16	6.27	24.17	6.04±1.337
P2 (silk worm food)	5.58	5.31	12.33	8.11	31.34	7.83±3.255
P3 (combination of pellets with silk worms)	5.68	5.58	5.69	4.99	21.93	5.48±0.330
Total					77.45	6.45±1.229

Based on the data above, it can be seen that the best feed conversion ratio is P3, namely 5.21, followed by P1 at 6.04, and P2 at 7.83. P3 is the treatment with the best FCR value, namely 5.21. The feed conversion ratio value states that to produce a shrimp weight of 1 gram, a feed amount of 5.21 grams is required. The FCR value is very closely related to the growth rate value. This means that the better the growth rate value, the better the feed conversion ratio value. This then underlies P3 having the best FCR value because its growth rate value is also the best between P1 or P2, as explained on the "Specific Growth Rate (SGR)" page above. Then P1 and P2 respectively follow with FCR values of 6.04 and 7.83. This is also in accordance with the growth rate values for each treatment.

The effect of the differences between each treatment on the FCR value of vannamei shrimp (*Litopenaeus vannamei*) can be determined by carrying out a follow-up test, namely the difference test. The different test used is the Duncan test. Duncan's test results showed that treatment P1 was not significantly different from P2 or P3. Likewise, P2 is not significantly different from P3. This shows that between each treatment given during the research period, there was no one treatment that had the best influence on the FCR value in rearing vannamei shrimp (*Litopennaes vannamei*), so it can be concluded that giving different types of feed did not have a significant effect on the value. Feeding ratio (FCR) maintenance of vannamei shrimp.

Survival

The survival value was obtained by calculating the ratio of the number of fish that lived to the number of fish that died at the end of the study. The data regarding the survival value (SR) of vannamei shrimp fry during the research period can be seen in Table 4:

Table 4. Survival (SR) of vannamei shrimp fry (*Litopenaeus vannamei*)

	Treatment				Average
P1 (pellet)	72.0	76.0	76.0	80.0	76.00
P2 (*Tubifex* sp.)	96.0	64.0	64.0	72.0	74.00
P3 (Combination)	80.0	88.0	88.0	80.0	84.00
Total	936.00	Total	936.00	Total	

Based on the data in the table above, it can be seen that P3, namely the maintenance treatment for vannamei shrimp fry by providing a combination of silk worms (*Tubifex tubifex*) with commercial pellet feed, provides the highest survival value, namely 84%.

This was followed by P1, namely the maintenance treatment for vannamei shrimp fry by providing commercial pellet type feed, which was 76%. Then it can also be seen that the treatment that provides the lowest survival value is P2. namely the treatment of rearing vannamei shrimp fry by feeding silk worms (*Tubifex tubifex*), which is 74%.

According to Perwira (2010), energy from the food eaten by living creatures (including vannamei shrimp) will be used for three main purposes. The most basic need is to survive. If the energy needs for survival have been met, then there is additional energy remaining from the food eaten, then this energy will be used for the next need which is a secondary need, namely for growth. Then finally, if the energy in a living creature's body has been used for survival purposes, then it has also been used for growth

purposes, and then there is still energy remaining, then the remaining energy will be used for reproduction or breeding purposes. This is in accordance with Handajani's (2009) statement, that living creatures at a young age will need more nutritional intake that is highly nutritious compared to living creatures that have entered adulthood. This is because when they are young, living creatures need a lot of energy to support growth and when they are adults, the growth aspect does not develop well.

The energy distribution theory as explained above then underlies the statement that survival value is strongly influenced by growth value. If the growth value is high, the survival value will also be high. Then this can be proven through the implementation of research, where P3, namely the maintenance of vannamei shrimp by providing a combination type of feed between silk worms (*Tubifex tubifex*) and commercial pellet feed, which has the highest specific growth rate value compared to other treatments (P1 and P2), again had the highest survival value compared to other treatments, namely P1 and P2. So it can then be concluded that the survival value and the specific growth rate value are directly proportional.

During the research period, P2 was the treatment that provided the lowest survival value, namely 74%. Then according to Riskiardiansyah (2008), the survival value for good rearing of vannamei shrimp fry ranges from 70 - 100%. This then explains that giving pellet feed (P1) or feeding silk worms (P2), or a combination of both (P3) for rearing vannamei shrimp fry during the research period gave survival values that were classified as quite good, namely above the limit. the lowest, namely 70%.

In order to find out the differences between each treatment and to determine the treatment that provides the best survival value (SR) for vannamei shrimp fry (*Litopenaeus vannamei*), a further test was carried out, namely the difference test. The results of the different tests show that P1 is not significantly different from P2 or P3. Likewise, P2 is not significantly different from P3. This shows that between each treatment given during the research period, there was no one treatment that had the best effect on SR, so it can be concluded that giving different types of feed did not have a significant effect on the survival value (SR) of vannamei shrimp. (*Litopenaeus vannamei*).

Water Quality

Water quality is a research supporting parameter which also influences the success of conducting the research. The water quality parameters observed include temperature, dissolved oxygen (DO), pH and salinity. Temperature and dissolved oxygen were measured twice every day, namely in the morning and evening during the research period using an oximeter. Then the pH was measured using a pH phen, and the salinity was measured using a refractometer.

The shipon process is carried out every day to maintain good water quality (Scabra & Setyowati, 2019). The shipon process is carried out every day and must be done carefully to avoid things such as the shrimp being sucked into the aquarium container through the shipon hose, or stress to the shrimp due to excessive activity in the aquarium container through the shipon process.

Apart from shipon, the process of replacing or circulating water is also carried out. In the early days of the research, the water replacement process was carried out with low intensity and low replacement quotas. Water changes are carried out every three days, the aim is to avoid stress for the shrimp kept in the aquarium container. The water replaced is 50% of the total water in the aquarium container. Then in the middle to the end of the research, the intensity of water changes was increased with the circulation quota reaching 75% of the total water flow in the aquarium container.

Data collection (average) of the results of water quality observations during the research period can then be seen in the following table:

Table 5. Water Quality Parameters for Vannamei Shrimp (*Litopenaeus vannamei*) Rearing Media During Research

Parameter	Treatment						Raw Value
	P1		P2		P3		
	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	
Salinity (ppt)	2,0	2,0	2,0	2,0	2,0	2,0	2 – 20*
pH	6,6	6,6	6,6	6,6	6,6	6,6	7,8 - 8,4**
Treatment (°C)	24,3	24,5	24,2	24,5	24,3	24,5	29 – 32**
DO (mg/lt)	6,8	7,0	7,0	7,2	7,1	7,3	5-10**

Source : *Hana, (2007) **Amri , (2008)

Salinity

The salinity used in this research, namely 2 ppt salinity, is a water quality parameter that has just been tested in rearing vannamei shrimp fry. This is based on research by Hana (2007), which states that vannamei shrimp can grow optimally at a salinity of 2 – 20 ppt.

Salinity in waters is closely related to the osmoregulation process in shrimp. The higher the salinity value in the water, the higher the energy used by the shrimp to carry out the osmoregulation process, and vice versa. This shows that a lower salinity value will be better for shrimp for their growth process. With low salinity values, energy that should be used for the osmoregulation process can be diverted to carry out other physiological processes, such as growth.

pH (derajat keasaman)

pH has a big influence on the life of aquatic plants and animals, so the pH content in water is often used as an indication of the quality of the cultivation media. Based on the water quality table above, it can be seen that the pH conditions in the vannamei shrimp rearing container fall into the alkaline value range, namely 6.6. This pH value is considered a condition that is not good for rearing vannamei shrimp. This is in accordance with the opinion of Amri (2008), who stated that the range of pH values that are good for rearing vannamei shrimp is between 7.8 – 8.4. The direct effects of low pH on shrimp include shrimp becoming porous and too soft because they cannot form new skin due to a lack of calcium. In these conditions, Scabra et al., (2016), recommend adding calcium both through media and feed.

Temperature

Water temperature is an environmental parameter that has a direct influence on the metabolic activities of organisms. Based on the water quality parameter table, it can be seen that the media temperature conditions during the research ranged from 22 - 23 oC. This range shows that the water temperature of the rearing media is very less than

the optimal conditions for shrimp cultivation, so that larval movement will be reduced (passive) and appetite will decrease which can result in very slow shrimp growth, because the energy in the shrimp's body is more focused on body maintenance.

The optimal temperature range for shrimp is around 30-32 0C. This is in accordance with Elovaara (2001) who said that a good temperature for rearing white vannamei shrimp larvae is around 28-32 oC. Apart from that, if the temperature is higher than 32 oC, the larvae's metabolism will increase so that the larvae's need for oxygen will also increase (Scabra & Budiardi, 2020).

Dissolved Oxygen (DO)

The water quality table during the research above shows that the dissolved oxygen value during the research ranged from 5.2 – 6.7 mg/lt. According to Ghufran (2007), the optimum oxygen content in the water for cultivating vannamei shrimp is 5-10 mg/lt, so that it can be seen that the dissolved oxygen content in the vannamei shrimp rearing containers in the research is sufficient and able to meet the needs of the vannamei shrimp. of oxygen. Scabra et al., (2022), stated that in optimal oxygen conditions, various types of aquatic biota can carry out their metabolic activities well.

CONCLUSION AND SUGGESTION

Conclussion

Based on the problem formulation observed during the research period, several conclusions can be drawn as follows:

1. Providing different types of feed has a real influence (*) on the specific growth rate value (SGR).
2. The best type of feed that can support the specific growth rate (SGR) value in rearing vannamei shrimp (Litopenaeus vannamei) is a combination feed type of Tubifex tubifex with pellets.
3. Providing different types of feed did not have a significantly different effect (ns) on the value of the feeding ratio (FCR) and survival (SR).

Suggestion

Based on a series of research that has been carried out, several suggestions/recommendations can be drawn as follows:

1. When rearing vannamei shrimp in low salinity media, a combination of silk worms (Tubifex tubifex) and commercial shrimp pellet feed should be used.
2. Natural food such as silk worms (Tubifex tubifex) should be given to fish (shrimp) in dry conditions.
3. In the second week of rearing vananmei shrimp (PL 42), where growth is very slow, appropriate management should be carried out, such as providing more nutritional intake or cleaning the vannamei shrimp rearing container so that the vannamei shrimp can grow better that week.
4. The value of the growth rate of vannamei shrimp during the research period was not better than the value of the growth rate of vannamei shrimp reared in brackish water areas, so it is necessary to carry out further studies regarding the economic value of rearing vannamei shrimp in low salinity media.

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