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The Influence of *Thalassiosira* Sp. in Feeding Regime on The Development and Survival Rate of Vaname Shrimp Larvae (*Litopenaeus Vannamei*)

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A B S T R A C T

Vaname (Litopenaeus vannamei) is a species of marine shrimp that has been widely cultivated in several regions in Indonesia. The hatching process of vaname was highly dependent on the use of natural feed. Phytoplankton is a natural food that is often used in the vaname hatchery. The natural food given is expected to provide good growth, development, and survival for vaname shrimp larvae. Thalassiosira sp. is one of the natural foods that is often used as natural food for shrimp larvae, high nutritional content and suitable size for shrimp larvae make it easier for shrimp larvae to predate on this type of phytoplankton. The purpose of this study was to examine the effect of different amounts of Thalassiosira sp. cells in feeding regimes on the development and survival of vaname larvae. This research was conducted at Marine Science Techno Park (MSTP), UNDIP, Jepara, Central Java. The research method used was an experimental method using a completely randomized design with 5 treatments and 3 replicates. The treatments used were treatments A, B, C, D, and E with the total amount of Thalassiosira sp. as mus as 56x104, 63x104, 70x104, 77x104, and 84x104 cell/ml, respectively. The vaname larvae used starting from nauplii stadia, were reared in jars with a size of 4 liters, and filled with seawater as much as 2 liters. The stocking density of vaname shrimp larvae was 100 larvae/liter. Maintenance of vaname shrimp larvae is carried out for approximately 10 days or until the post-larva stage. The data showed that the differences amount of Thalassiosira sp. cells in the feeding regimes of vaname larvae resulted in significantly effects (P<0.05) on the total feed consumption and survival of vaname larvae. However, there was no effect (P>0.05) on the larval development. Based on these results, the best treatments were obtained in treatments C and D, on the total feed consumption value of 486.67±25.17x103 and 480.0± 20.00x103 cells/ml, and the survival rate values of 76.30±2.25% and 78.00±3.50%, respectively.

Keywords: *Thalassiosira, vaname larvae, feeding regime*

1. Introduction

Vaname shrimp (*Litopenaeus vannamei*) cultivation has been carried out in several regions in Indonesia but is still faced with obstacles in the form of fry quality from *hatchery*, namely slow growth, non-uniform size, and vulnerability to environmental changes. The low quality of these fry can be caused by poor genetic quality, production processes, and production technology. In production processes such as natural feeding with phytoplankton cells, *Thalassiosira* sp. diatoms need to be prepared as well as possible, including the number, and quality of cells, and the right time of administration so that the growth and survival of larvae are high. Conversely, if the number of natural feed cells given is lacking, of low quality, and not on time in its administration, it will produce larvae that have low quality and survival. The production of fry with low quality will eventually have a fatal impact on the failure of shrimp rearing cultivation in ponds. In larval stages, shrimp have a very small mouth opening size so the selection of feed size is very important (Putri et al., 2020).

The use of natural feed in the form of plankton in the process of raising vaname shrimp is one of the keys to being able to produce vaname shrimp larvae that have a good development, growth, and survival. Phytoplankton is often used in the process of enlargement of vaname shrimp larvae as natural feed because it contains nutrients and sizes that are suitable for the development and growth of vaname shrimp larvae. According to Devianti et al. (2022), *Thalassiosira* sp. has the nutritional content that is qualified for the growth of vaname shrimp larvae. The size of *Thalassiosira* sp. is smaller and corresponds to the mouth opening of shrimp in the nauplius phase to the zoea and is easy to culture.

Thalassiosira sp. is a type of microalgae plankton commonly used as natural feed for shrimp larvae. The high nutrient content in *Thalassiosira* sp. is one of the main factors chosen as natural feed. *Thalassiosira* sp. is smaller in size according to the mouth opening of shrimp in the *nauplius phase to* the zoea, *and is easy to culture. Thalassiosira* sp. has a diameter of 4-32 µm and a protein content of 21.85-37%, fat of 2.41-10%, and carbohydrates of 17-21% (Erlangga et al., 2021).

In the administration of *Thalassiosira* sp. In the process of shrimp larvae enlargement, it is necessary to know the right number of doses *and feeding regime* so that vaname shrimp larvae have maximum development and survival. Giving excessive amounts of feed will increase production costs and

waste and cause excessive feed residues which result in a decrease in water quality that affects the growth and survival of shrimp. Therefore, it is necessary to know the appropriate dose of feed (Usman et al., 2020).

2. Materials and Methods

Research Material

This research used tools including 4 L plastic jars, 5 L plastic jars, 1 L glass bottles, 500 ml erlenmeyer, autoclave, hemocytometer, cover glass, volume pipettes, drip pipettes, hand counters, aerators or blowers, hoses, aeration stones, styrofoam, yellow lights, Olympus brand microscopes, electric scales, thermometers, pH meters, atago brand refractometers. The material used in this study was the larvae of vaname shrimp (*Litopenaeus vannamei*) in stadia nauplii obtained from PT. Windu Alam Sentosa, Rembang, Central Java. Larvae for vaname shrimp research were given natural feed in the form of *Thalassiosira* sp. obtained from a pure culture of the Live Feed Laboratory of the Brackish Water Aquaculture Development Center (BBPBAP), Jepara. Artemia sp. cysts and artificial feed in the form of powder, walne media as fertilizer in phytoplankton culture and sterile seawater as a maintenance medium.

Research Methods

The method used in this study is an experimental research method. Experimental methods are research methods used to look for the effect of certain treatments on others under controlled conditions (Sugiyono, 2011). This research was conducted at Marine Science Techno Park (MSTP), UNDIP, Jepara, Central Java.

Experiment Design

This study used a Complete Randomized Design (RAL) with 5 treatments and 3 repeats in each treatment. Maintenance is carried out for approximately 10 days. Maintenance is completed when the larvae of vaname shrimp have reached the *post-larval* (OT) stadia. The density of natural feed is maintained by calculating *Thalassiosira* sp. in the maintenance container and added according to the needs of each dose so that the density matches the dose applied. This study refers to BSN (2009) regarding the use of feed types and doses on stadia in the production of vaname shrimp fry. The dose determination in the study treatment was based on the dose used in SNI 7311:2009 for vaname shrimp larvae but with different types of phytoplankton. The dose contained in SNI is used as a reference for middle treatment or treatment C.

Natural feeding treatment with a comparison of the number of different cells in this study is presented in Figure 1. Color differences show differences in treatment and Z1 to PL1 show stadia in vaname shrimp larvae.

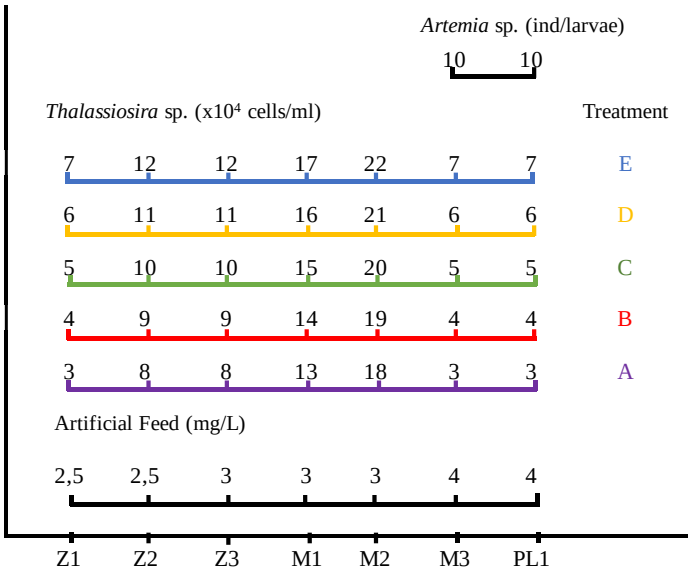


Fig 1. *Feeding Regimes of* Vaname Shrimp Larvae (*Litopenaeus vannamei*) by Administering Different Numbers of *Thalassiosira* sp. Cells.

Research Procedure

Research Preparation

Sterilization of Tools and Materials

The preparation that needs to be done in this study begins with the sterilization process of tools and materials. The sterilization process is to kill or destroy all types of microorganisms in the tools and materials to be used in research, to create aseptic conditions so that there is no contamination during the research process. In general, sterilization can be done by 3 methods: mechanical, physical, and chemical. There are various kinds of sterilization processes

carried out in this study. Tools such as 5 L plastic jars, aeration hoses, and aeration stones are sterilized by washing with soap and rinsing using clean running water and then drying. Sterilization of laboratory equipment such as erlenmeyer, petri dish, volume pipette, drip pipette, slide glass, and cover glass is done by washing with soap and rinsing with running water, then putting into the autoclave at 121 ° C for 15 minutes. According to Hardono and Kuat (2020), sterilizing various kinds of equipment and equipment used in microbiology using hot water vapor is generally 15 Psi and with a temperature of 121 ° C. Duration of sterilization carried out for 15 minutes.

Seawater is sterilized using a chlorine dose of 50 ppm and left for 24 hours, then sodium thiosulfate is added at a dose of 15 ppm and strongly aerated then left for 24 hours. Seawater is filtered with filter bags then sterilized using 60 ppm chlorine solution for 24 hours and neutralized with 20 ppm Na-Thiosulfate solution until it does not smell chlorine (Isnansetyo and Kurniastuti, 1995).

Making Culture Media

According to Walne (1970) in Andersen (2005), the composition in Walne media consists of Walne media, trace elements and vitamins and sodium metasilicate (Na2SiO3) 40 mg/L specifically for diatoms. Making Walne media for diatomaceous phytoplankton culture begins by mixing Walne media into 1 L of filtered seawater. The next step is to add nutrient solution of 1 ml of *trace elements* and 100 µL of vitamin solution. The explanation of making solutions of trace elements and vitamins exists after the manufacture of Walne media. The composition of Walne's media can be seen in Table 1.1.

Table 1.1 Walne Media Composition

No.	Nutrients	Sum
1.	NaNO3	100 grams
2.	H3BO3	33.6 grams
3.	Na2EDTA	45 grams
4.	NaH2PO4.H2O	20 grams
5.	FeCl3.6H2O	1,3 grams
6.	MnCl2.4H2O	0,36 grams
7.	Trace Element	1 ml/L
8.	Vitamin	100µL

This study used Walne media for the cultivation of *Thalassiosira sp.* with the addition of *trace elements*. The composition of *trace elements* in Walne media can be seen in Table 1.

Table 1. Composition of *Trace Elements* in Walne Media

No.	**Nutrients**	**Sum**
1.	ZnCl2	21 grams
2.	COCl2.6H2O	20 grams
3.	$(NH4)_{8MJ7O24.4H2O}$	9 grams
4.	CuSO4.5H2O	20 grams
5.	Aquades	100 ml

The composition of vitamins in Walne media is thiamine (vitamin B1) 1 g and cyanocobalamin (vitamin B12) 50 mg. The manufacture of the solution begins with the sterilization of aquades 950 ml with an autoclave. The next step is to dissolve thiamine and cyanocobalamin into 950 ml of aquades. Vitamin solution stored in the freezer.

Preparation for stocking vaname shrimp larvae

The research preparation process of vaname shrimp larvae is carried out by preparing containers and maintenance media. Maintenance containers in the form of jars along with hoses and aeration stones that have previously gone through the sterilization process are placed according to the layout of the maintenance container. Sterile seawater that has been adjusted for salinity levels in accordance with SNI and the origin of vaname shrimp larvae is put into a jar and ready to be used for rearing media for vaname shrimp larvae.

Acclimatization is done when vaname shrimp larvae are stocked in maintenance containers. According to Nuntung et al. (2018), temperature acclimatization is carried out by immersing nauplii bags in tanks filled with seawater in circulating conditions for approximately 30 minutes. After the water temperature of the nauplii bag is the same as the water temperature in the acclimatization tank, the nauplii is removed from the plastic bag and then

carefully poured into the tank for further acclimatization of salinity. The process of acclimatization of salinity in the tank is carried out for approximately three hours without water circulation and is given aeration.

3. Data Collection

Total Feed Consumption

Total Feed Consumption (TKP) in vaname shrimp larvae can be calculated by counting the number of phytoplankton cells in the rearing media. The density of phytoplankton in the media is maintained according to dosage requirements in each treatment by adding stocks from pure cultures according to the sampling results (Panjaitan et al., 2015).

Total natural feed consumption is the amount of feed consumed by shrimp larvae, according to Haryati et al., (2010) can be calculated using the following formula:

$P = P1 – P0$

where: P = The amount of natural feed consumed each day (cells/ml)

P1 = Amount of natural feed residue on day 1 (cells/ml)

P0 = Amount of natural feed given on day 0 (cell/ml)

Larval development

The development of vanamei shrimp larvae is observed from nauplius phase 4-5 to post-larva-1. In observations made by nauplii changed to zone-1 calculated from the time of stocking to the observation time which is approximately 14 hours. Wyban and Sweeney (1991) state that the shape changes from stadia nauplii to stadia zoea approximately 40 hours after hatching. Stadia zoea undergoes three substadia changes (zoea-1, zoea-2, and zoea-3) lasting three days in accordance with the opinion of Martosudarmo and Ranoemiraharjo (1980), who state that the zoea phase lasts for 3–4 days (three stadia). Furthermore, in stadia mysis, there were also three substadia changes (mysis-1, mysis-2, and mysis-3) which lasted for 3 days. Post-larval stadia do not undergo development or morphological changes (metamorphosis) in accordance with the opinion of Wyban and Sweney (1991), which states that the last and most perfect form of all forms of development of vaname shrimp larvae is post larvae. In this stadia, the larva does not change in shape or metamorphosis, because all its limbs are complete like adult shrimp. So that as age increases, larvae only experience changes in length and weight.

Survival

According to Budiardi (2008), the survival calculation can be calculated using the following formula:

$SR = Nt / No \times 100\%$

where: SR = Survival

Nt = Number of live shrimps at the end of the study

No = Number of live shrimps at the start of the study

Water Quality

Water quality observations during the study were carried out using water quality measuring devices such as Water Quality Checker (WQC) to measure dissolved oxygen levels in water, thermometers to measure water temperature, pH meters, and refractometers to determine the salinity of media during maintenance.

Data Analysis

The results of observing the effect of differences in the number of cells *Thalassiosira* sp. In feeding regimes in the form of development, total feed consumption, and survival rate of vaname shrimp larvae are analyzed by statistical tests and presented in graphic form. The data obtained were then carried out with statistical analysis with tests of normality, homogeneity, and additivity. Data that is normal, homogeneous and additive will then be continued with variety analysis (ANOVA). The results of the ANOVA test that showed a real difference were then tested in the Duncan region. Water quality data is analyzed descriptively concerning relevant references.

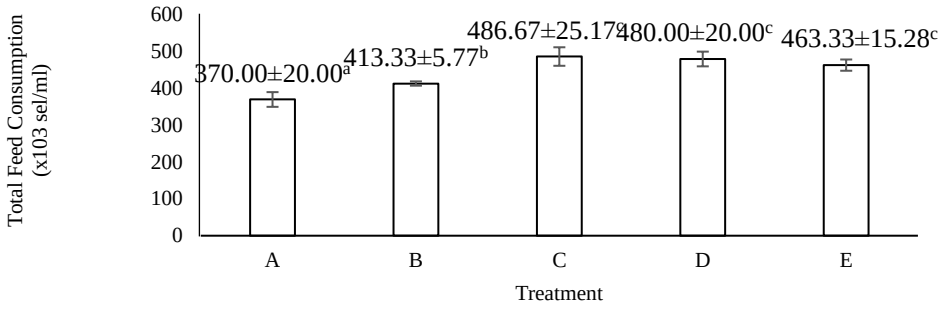
4. Result and Discussion

Result

Total Feed Consumption

Based on research on the effect of *Thalassiosira* sp. in feeding regimes on the development and survival of vaname shrimp larvae (*L. vannamei*), a graph of Total Feed Consumption (TKP) was obtained which is presented in Figure 2.

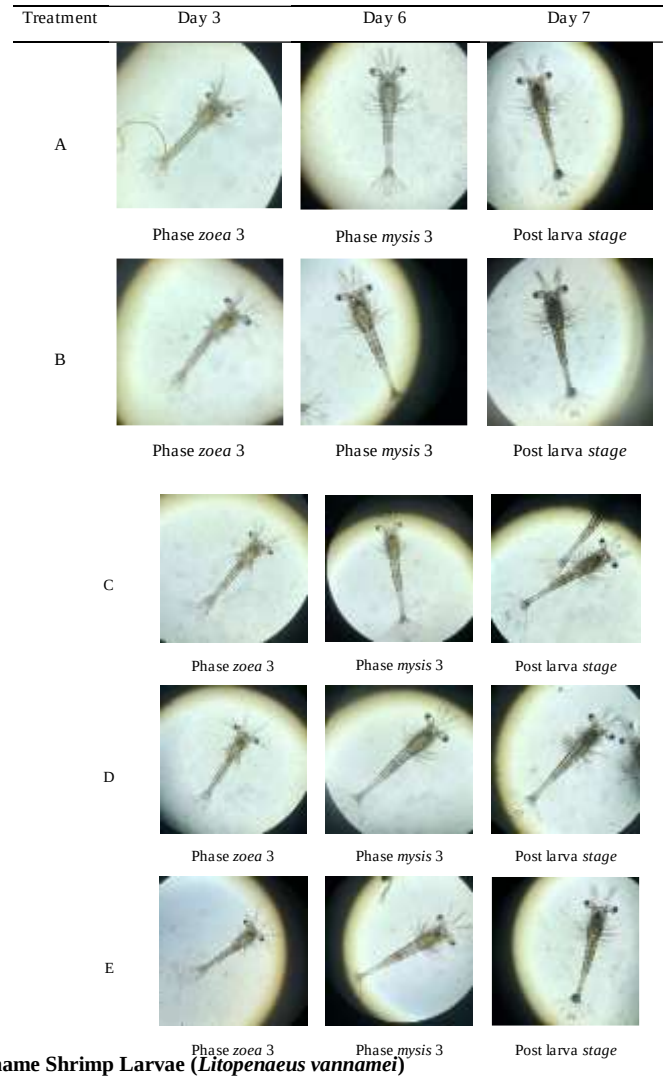
Fig 2. Histogram of Total Natural Feed Consumption *Thalassiosira* sp.



Vaname Shrimp Larvae (*Litopenaeus vannamei*) Feed with Different *Feeding Regimes*.

Larval development

Based on the rearing of vaname shrimp (*L. vannamei*) larvae carried out during the rearing process, larval development can be seen in Figure 3.



A

Fig 3. Development of Vaname Shrimp Larvae (*Litopenaeus vannamei*)

Survival Rate

The survival rate achieved by the larvae of vanamei shrimp (*Litopenaeus vannamei*) during rearing, obtained a graph of the survival rate presented in Figure 4.

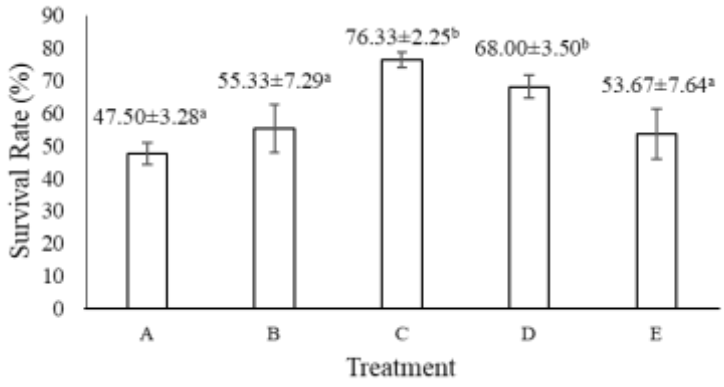


Fig 4. Survival Rate of Vaname Shrimp Larvae (*Litopenaeus vannamei*) with *Different* Feeding Regimes

Water Quality

The quality of water obtained during the study of raising vanamei shrimp larvae (*Litopenaeus vannamei*) is presented in Table 2.

Table 2. Water Quality in the Rearing of Vaname Shrimp Larvae (*Litopenaeus vannamei*)

Water Quality Parameters	**Range Value**	**Credentials**
Temperature (°C)	30-32	28-32[a]
Salinity (ppt)	30-33	29-35A
Dissolved Oxygen (ppm)	5,40-6,50	4-6A
Ph	8,07-8,43	7.5-8.5[b]

Description:

[a]) Tibun *et al*., (2015)

[b]) BSN (2009)

5. Discussion

Total Feed Consumption

Based on the analysis of various studies that have been conducted, it can be seen that natural feeding with different doses has a real influence on Total Feed Consumption (TKP) in vaname shrimp larvae (*L. vannamei*). This is shown by the lowest total feed consumption value in treatment A of 370.00±20.00 x103 cells/ml and the highest treatment in treatments C, D, and E which are not significantly different from the value of treatment C of 486.67 ± 25.17 x 103 cells/ml, treatment D of 480.00 ± 20.00 x 103 cells/ml, and treatment E of 463.33 ± 15.28 x 103 cells/ml. The highest Total Feed Consumption Value (TKP) in treatments C, D, and E is thought to be because the number of phytoplankton cells given has a sufficient number range for vaname shrimp larvae. So that vaname shrimp larvae can consume natural food without any competition or fight for natural feed with other vaname shrimp larvae. In addition, vaname shrimp larvae can eat more phytoplankton cells that have good conditions or quality. According to Rakhfid et al., (2017), the occurrence of competition between individuals in utilizing space and obtaining food sourced from natural feed can affect the survival rate of vaname shrimp larvae (*L. vannamei*), natural food available in sufficient quantities can suppress competition between individuals in utilizing space and obtaining food. Higher competition for feed can cause shrimp to be more aggressive and cause stress in shrimp and trigger cannibalism between individuals, and will result in increased death of shrimp larvae so that the level of feed consumption is not optimal.

The difference in the number (dose) of *Thalassiosira* sp. cells in Total Feed Consumption (TKP) during the rearing period of vaname shrimp larvae (*L. vannamei*) has a noticeable effect. Treatment A showed the lowest total feed consumption results with a value of 370.00±20.00 x103 cells/ml. This is suspected because the number of *Thalassiosira* sp. cells given in treatment A maintenance media has a number that is not by the needs of vaname shrimp larvae in the maintenance media. This results in competition in vaname shrimp larvae when consuming natural food. Another factor is related to the quality of the feed given. Phytoplankton that have been included in the maintenance media will experience a decrease in quality than when they are in plankton culture media. Because in the maintenance media, the water quality is not optimal for phytoplankton and the presence of other microorganisms that live, causing contamination. According to Gustrifandi et al., (2011), many natural feeds are used in raising shrimp larvae, the problem that often occurs is the failure to obtain sufficient feed density and dose for shrimp larvae that are kept. Cases that are often encountered are the problem of non-uniformity in the growth of shrimp that are kept, besides that shrimp growth is often stunted. This problem is often caused because the distribution of feed does not match the spread of shrimp populations.

Total Feed Consumption (TKP) in the rearing of vaname shrimp larvae (*L. vannamei*) has different results in each treatment. This is thought to be because the amount (dose) given in each treatment has an impact on vaname shrimp larvae in getting feed for consumption. The amount of excess feed in treatment E does not give better total feed consumption results than treatments C and D. It is suspected because the dose for daily needs has been met in treatment C. The number of cells *Thalassiosira* sp. The excess will not be consumed by vaname shrimp larvae optimally so it can experience a decrease in quality and can cause a decrease in water quality due to the deposition of dead plankton. According to Nofiyanti et al., (2014), larval growth, survival, and water quality of larval rearing depend on the quality and quantity of food. Different feeding regimes can find out which feeding regime is appropriate for shrimp larvae. Appropriate feeding regimes can improve larval development and survival rates. The right feed has criteria for type, size, dosage and nutrition according to the needs of shrimp larvae. Dead phytoplankton will affect the quality of plankton that are still alive, so it will result in a decrease in feed quality in the maintenance media and a decrease in water quality. According to Gustrifandi (2011), the direct influence of feeding on shrimp growth is the ability of the shrimp to maintain life and growth. The indirect influence is the environment, if the feed is not eaten or a lot of feed is left, it will cause a decrease in water quality, causing unfavorable conditions for the life and growth of shrimp. The selected shrimp feed must be of good quality with the criteria of suitable and preferred shrimp and by the size of its mouth opening.

Larval development

Based on observations during the rearing of vaname shrimp larvae (*L. vannamei*), the development of vaname shrimp larvae in all treatments showed the same development results in all treatments. The difference in the amount (dose) of natural feed *Thalassiosira* sp. in vaname shrimp larvae has no noticeable effect on larval development. The development of vaname shrimp larvae in treatment A where the least amount (dose) of natural feed does not affect the development of vaname shrimp larvae but does affect the survival rate. This is thought to be because the need for natural feed in living larvae is still fulfilled but there is competition or struggle for food, causing high mortality. According to Subandiyono and Hastuti (2016), the availability of feed when larvae are foraging is a very important factor, where larvae that lack food will result in stunted development and growth, and increase mortality rates.

The development of vaname shrimp larvae (*L. vannamei*) at the end of rearing shows that shrimp larval stadia in all treatments are present in *post-larval* stadia, indicating that surviving shrimp can metamorphose from stadia *nauplius* to *post larvae* well. It is suspected that the need for feed on shrimp larvae in all larvae has been fulfilled, the type of feed obtained by vaname shrimp larvae comes from natural feed in the form of *Thalassiosira sp.,* Artemia *sp.*, and artificial feed in the form of powder. The difference in the amount (dose) of natural feed given does not have an impact on the development of vaname shrimp larvae but has an impact on the survival rate of vaname shrimp larvae due to the fight for feed on the maintenance media. According to Panjaitan *et al*., (2014), the percentage of survival rate that reaches stadia zoea or the success of metamorphosing from nauplius to zoea is one of the quality criteria for vaname shrimp larvae. Stadia zoea and mysis are phases of rapid growth and are very critical time because at that time shrimp larvae are very vulnerable and there is often a high mortality rate. Nauplius with high nutrient reserves can survive during metamorphosis into zoea and during stadia zoea and mysis physiological adaptation to food of external origin.

The difference in the number of phytoplankton cells in the form of *Thalassiosira* sp. in vaname shrimp larvae (*L. vannamei*) in all treatments did not show any difference in larval development. The length of time to reach stadia zoea 1 to zoea 3 is reached for 3 days. Similarly, mysis stadia 1 to mysis 3 lasts for 3 days. These results show that all treatments have not been able to accelerate the development of vaname shrimp larvae. Although this study has not been able to show faster development of vaname shrimp larvae, all treatments show normal larval development. According to Devianti et al., (2022), stadia zoea 1 to zoea 3 will be reached in 3 days, as well as stadia mysis 1 to mysis 3 lasting for 3 days. The natural feed given to larvae will affect growth, wherease larvae will grow and develop depending on food nutrient intake. Factors of feed availability and consumption of natural feed are thought to also affect the development of larvae. The larvae will eat food whose size can enter the mouth of shrimp larvae. Food entering the mouth will be digested, and after that it will be metabolized and used as nutrients to develop and move.

Survival Rate

The results of variety analysis showed that natural feeding with different numbers of *Thalassiosira* sp. cells had a significant influence on the survival of vaname shrimp (*L. vannamei*) larvae at the end of rearing. The highest graduation results were found in C and D treatments with survival rates of 76.30±2.25% and 78.00±3.50%. The lowest graduation rate scores were in treatments A, B, and E. The three treatments did not differ markedly with scores of 47.50±3.28%, 55.30±7.29%, and 53.67±7.64%. Comparison of the amount of natural feeding *Thalassiosira* sp. shows that there is an influence on the survival rate of vaname shrimp larvae (*L. vannamei*). According to Usman *et al*., (2021), factors that can affect high and low survival are internal factors including physiological and genetic conditions of shrimp larvae and external factors including environmental conditions, feed, disease, and stocking.

Survival in the rearing of vaname shrimp larvae is also related to the ability to moult in shrimp larvae related to the availability of feed given. According to Putri et al., (2020), the problem faced in shrimp larva production is low yield due to high mortality. This is due to an insufficient supply of good feed in terms of quantity and quality. The feed given in raising vaname shrimp larvae must be of high quality, nutritious and suitable for shrimp consumption, and available continuously so that it does not interfere with the production process and can provide optimal growth. However, in treatment A to E, there is daily feed residue which shows that the need for natural feed in all treatments is available in each maintenance media. Another factor that can cause death in shrimp larvae is the stress experienced in shrimp larvae. Stress experienced by shrimp larvae can occur due to various factors, one of which is due to environmental factors. A good environment will increase the resistance of the maintained organism, while a bad environment will cause the maintained organism to become stressed and can reduce resistance to disease attacks, which can cause mortality (Feliatra et al., 2014).

The best survival rate at the end of maintenance was obtained from C and D treatment with survival rates reaching 76.30±2.25% and 68.00±3.50%. Different numbers of cells (doses) of natural feed exert different influences on each treatment. This is thought to be due to the suitability of the number

of natural feed cells given to vaname shrimp larvae. According to Subandiyono and Hastuti (2016), the availability of feed when larvae are foraging is a very important factor, where larvae that lack food will result in stunted development and growth, and increase mortality rates. In addition to feed, factors that can affect the survival rate of vaname shrimp larvae are internal factors in the form of physiological and genetic conditions in larvae. According to Swain and Nayak (2009), healthy broods can give birth to healthy larvae also because the mother has a great influence on the phenotype of its unity. In addition to inherited genetic factors, several non-genetic factors such as hormones, nutrition, and immunity are transferred by the parent to the offspring and they are very important for the early stages of the larva's life.

Water Quality

The results of water quality measurements during the rearing period of vaname shrimp larvae *(L. vannamei*) show that the dissolved oxygen content (DO) in maintenance has met the minimum requirements for the maintenance of vaname shrimp larvae, the results of measuring dissolved oxygen content during the maintenance period range from 5.40-6.50 ppm. According to Tibun et al., (2015), good dissolved oxygen levels range from 4-6 ppm. Oxygen in water is needed for the process of respiration (breathing), especially *L. vannamei.* If DO (dissolved oxygen) is in optimum conditions, the metabolism in the larval body will be optimal and the energy produced will be a lot, so there will be a lot of excess energy used in larval growth.

During the rearing process of vaname shrimp (L. vannamei*)* larvae, the temperature and pH in the rearing period show a range that matches the limits of the vaname shrimp larval rearing criteria. The temperature and pH measurement results during the maintenance period range from 30-32°C for water temperature and 8.07-8.43 for pH. According to Tibun et al., (2015), the optimal temperature for the growth of vannamei shrimp ranges from 28-32 °C. In general, the growth rate of vannamei shrimp larvae will increase along with the increase in temperature to a certain extent because it causes the level of feed consumption to increase. The highest appetite of vannamei shrimp occurs at 30°C. According to BSN (2009), the pH for vaname shrimp larvae in the nauplius and fry production process is around 7.5-8.5.

The salinity of the water during the rearing period of the larvae of the vaname shrimp (*L. vannamei*) shows a range that corresponds to the criteria for the rearing of vaname shrimp larvae. The result of salinity measurement during the maintenance period is in the range of 30-33 ppt. The range corresponds to salinity criteria during the rearing period of vaname shrimp larvae. According to Tibun et al., (2015), the optimum salinity for shrimp life is 29-35 ppt. At salinities outside the optimum range, vanname shrimp larvae will expend more energy for osmoregulation so that the energy available for growth will be less. Therefore, if the salinity deviates too greatly, the larvae of vannamei shrimp will die because they cannot perform homeostasis.

6. Conclusion and Advice

Conclusion

Based on the research that has been carried out, the following conclusions can be drawn:

1. The difference in the number of cells of *Thalassiosira* sp. in the feeding regime has the same effect (P>0.05) on the development of vaname shrimp larvae (*L. vannamei*) but has a significantly different effect (P<0.05) on the survival rate of vaname shrimp (*L. vannamei*) larvae.
2. Differences in the number of cells *Thalassiosira* sp. in the feeding regime of vaname shrimp larvae (*L.* vannamei) in treatments C and D obtained better results than treatment A, B, and E. With the value of the survival rate of vaname shrimp larvae in treatment C of 76.30±2.25% and in treatment D at 68.00±3.50%.

Suggestion

The advice that can be given based on the results of the study "The influence of *Thalassiosira* sp. in the Feeding Regime for the Development and Survival of Vaname Shrimp Larvae (*Litopenaeus vannamei*)" is the dose of phytoplankton *Skeletonema* sp. and *Chaetoceros* sp. used in SNI 7311: 2009 for vaname shrimp larvae can be used for phytoplankton *Thalassiosira* sp. on feeding regimes of vaname shrimp larvae.

7. References

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