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Analysis of causes of changes in conditions of vannamei shrimp hepatopancreas indicators at PT. Lombang Sumber Rejeki Sumenep

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Abstract. Vannamei shrimp that are cultivated intensively require various steps to support the success of cultivation, one of which is observing the health condition of the shrimp. Shrimp health monitoring is carried out once every 10 days along with sampling activities. One of the parameters in shrimp health monitoring is a microscopic examination of the hepatopancreas using the wet preparation method. The indicators for determining the condition of the hepatopancreas organ that was observed microscopically were wrinkles, lipid, gregarine, necrosis, and microvilli whose results were expressed in percentage form. The purpose of this study was to determine the cause of changes in the condition of the hepatopancreas indicator which has an important role in the health of vannamei shrimp. This research was conducted in intensive ponds of PT. Lombang Sumber Rejeki which is located in Lombang Village, Batang

- Batang District, Sumenep Regency. Data processing is done using Regression analysis. The peak increase in increase in the percentage of wrinkles occurred at the 4th sampling or the 40th DOC. Wrinkles increased in intensive ponds were significantly affected by lipid, microvilli, and gregarine conditions. Lipid indicators in hepatopancreas were significantly influenced by the type and amount of feed-in shrimp. Vibrio population combined with the average daily feeding can significantly affect the gregarine population. The microvilli are affected by the incidence of necrosis in the hepatopancreas tubules, the cause of the necrosis is thought to be due to factors other than the Vibrio population in the hepatopancreas.



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1. Introduction

Shrimp health management is one of the actions that can be applied in increasing the productivity of shrimp farming. On the implementation of shrimp health management activities is monitored to find out the condition of the vannamei shrimp commodity in activities cultivation. Shrimp health monitoring and shrimp health management is the most appropriate action to prevent the occurrence of an infection in shrimp.

Test parameters used as a determinant of shrimp health. One of them is microscopic examination of the hepatopancreas. Observation of the hepatopancreas organ has an important role, because: it has a major role in supporting health monitoring shrimp. Severe damage to the structures of the hepatopancreas will cause stress in shrimp so that it will increase the risk of high sensitivity to viral and bacterial infections worsen the health of vaname shrimp so that it can increase the risk of causing the death of shrimp [1]

In carrying out the observation of the hepatopancreas organ, it is necessary to do microscopic observation. Indicators used in microscopic observation of hepatopancreas organs including microvilli, necrosis, gregarine, lipid, and wrinkle as determinants of condition hepatopancreas. Hepatopancreas is an important organ in shrimp (liver and pancreas) which are very sensitive to changing conditions environment, especially on unhealthy media [2]

In the intensive enlargement of vaname shrimp at PT. Lombang Sumber Rejeki already has Factory Operating Standards (SOP) in implementing shrimp health management. Based on this, Researchers used a baseline hepatopancreas monitoring on the Standard Operating Procedures (SOP) at PT. Lombang Sumber Rejeki [3]

2. Materials and methods

The research was conducted from March to May 2021 located in the shrimp ponds of PT. The wave of the source of fortune with a wide plot a 1050 m² pond. Tested samples for condition monitoring hepatopancreas taken every 10 days along with sampling shrimp growth, live shrimp samples obtained randomly on ancho. Hepatopancreas testing was performed routinely microscopically using the wet preparation method, each test using 4 samples of shrimp hepatopancreas then the results averaged. The hepatopancreas observation indicators consist of: microfilii, gregarine, lipid, necrosis and wrinkle, as well as carried out implantation of hepatopancreas on TCBS media to determine the population *Vibrio* hepatopancreas. Data obtained during the activity process cultivation were collected and analyzed using Regression Test.

3. Results and discussion

The results of testing the hepatopancreas organ which is carried out every 10 days once, the following results are obtained:

3.1 Hepatopancreatic lipids

The results of the observation of lipid indicators observed in the tubules hepatopancreas showed that the percentage of lipids with increasing time or DOC has increased, it can be seen in Figure 1.

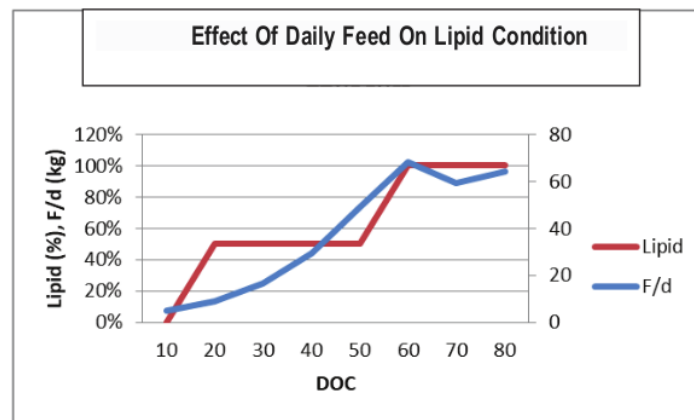


Figure 1. Relationship of hepatopancreatic lipids with average daily feed

Lipids in the hepatopancreas are fats resulting from the digestive process shrimp as an energy reserve whose value is assumed to be shrimp digestive system. Based on the data obtained then comparison of the percentage of lipids and the average feeding daily. The results of the regression analysis state that there is a relationship significant difference between the percentage of hepatopancreatic lipid and the mean daily feeding, with the equation $Y = 0.172 + 0.012X$, where Y = lipid percentage (%), and X = average daily feed (kg). The effect of the average daily feed on the percentage of lipids is 76.9% and get the influence of 23.1% by other factors.

Lipids are the result of the digestive system of shrimp, which resembles round spots on the hepatopancreatic tubules. At the beginning of cultivation the percentage of lipids is still in a minimal condition due to vaname shrimp still not completely eating artificial feed and is dominated by feed natural like plankton. This is suspected to be the cause lipid percentage was minimal at the beginning of cultivation. As for with increasing DOC cultivation, the lipid percentage will increase increased due to the increase in artificial feeding in activities vaname shrimp cultivation. Determination of the percentage of lipids can be seen in Figure 2.

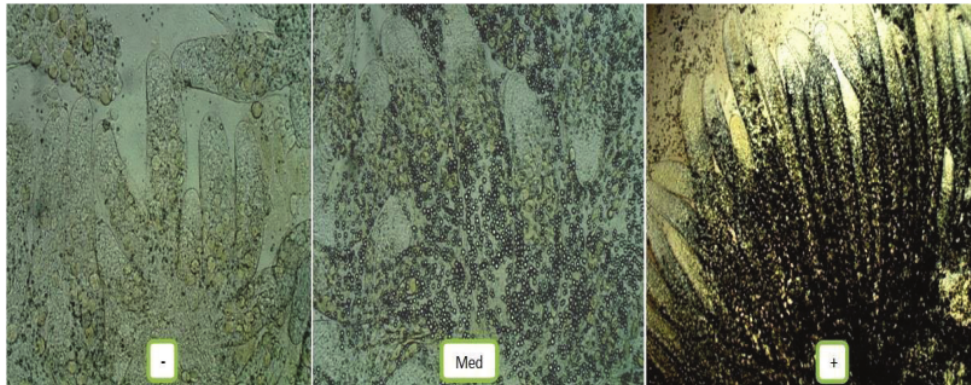


Figure 2. Determination of hepatopancreatic lipid condition

3.2 Gregarine hepatopancreas

Gregarine hepatopancreas is a parasite that lives in the tubules. The hepatopancreas resembles a yellowish worm. Arief [4] states that, gregarin is a large protozoan, belongs to the class Gregarinidea or Gregarina. These parasites are generally found in body cavities and in the digestive tract of invertebrates. The presence of the Gregarin parasite in the intestines is the cause of the damage digestive organs.

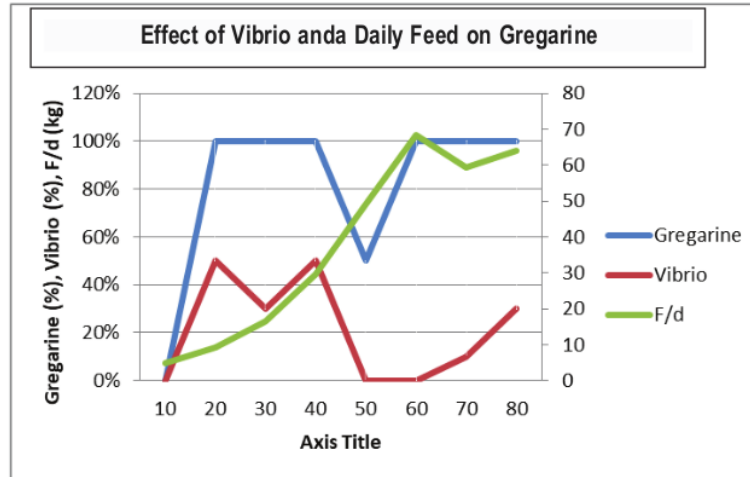


Figure 3. Pattern of gregarine, Vibrio and average daily feed

Based on the results of multiple regression analysis there is a significant relationship significant difference between the percentage of gregarine affected by Vibrio percentage and average daily feed.

With regression equation $Y = 0.125 + 0.010X_1 + 1.419X_2$, where Y = gregarine hepatopancreas (%), X_1 = F/d (kg), and X_2 = *Vibrio* hepatopancreas (%). Based on regression analysis concluded that 65.7% of the variation that occurred in the percentage of gregarine can be explained by the percentage of *Vibrio* hepatopancreas and the average daily feeding, while the rest 34.3% is explained by other factors.

In testing activities the early emergence of gregarine is associated with change in the dominance of the type of food eaten by shrimp. Beginning Shrimp food cultivation is still dominated by natural feeds such as plankton, after being tested the percentage of gregarine is still in good condition minimal. Along with the increase in DOC, the percentage of gregarine is increasing increase. This is thought to be due to an increase in the number of feedings which resulted in shrimp digestion being dominated by artificial feed accompanied by with the increasing burden of water quality due to the increase in the amount of artificial feed given. As for determining the percentage gregarine can be seen in Figure 4.

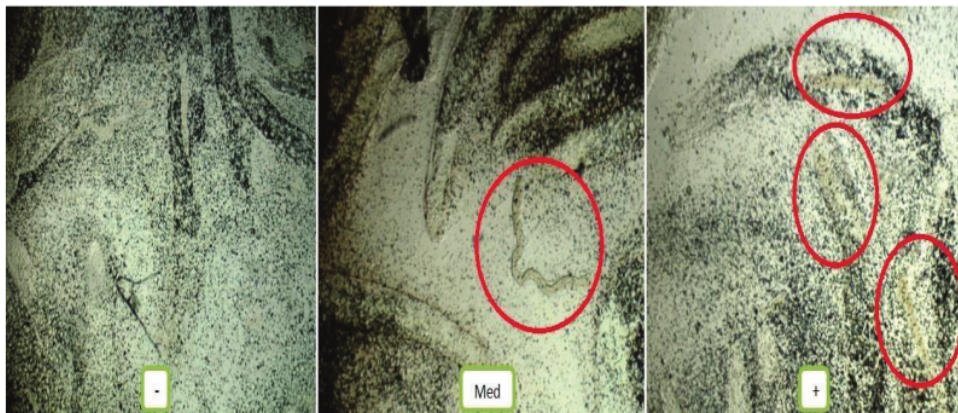


Figure 4. Determination of the condition of hepatopancreas gregarine

The amount of feed given will result in an increase in the content of organic matter, feces or artificial feed that is not eaten, that is will result in a decrease in water quality. Average giving the average daily feed amount continues to increase along with an increase in the *Vibrio* population has an effect on increasing gregarine percentage. Kua et al. [5] stated that, the condition poor water quality, gregarine-type protozoa along with *Vibrio* bacterial infection in the digestive tract of shrimp causes changes in the structure of hepatopancreas tissue into microvilli tissue in the intestines.

The higher the *Vibrio* population, the more potential to become pathogenic in shrimp that can cause disease. *Vibrio* population has an assessment score, the higher the *Vibrio* percentage is assumed as the number increases. Determination of the percentage of the amount rank on *Vibrio* hepatopancreas based on SOP PT. Lembang Sumber Rejeki can be seen in Table 1.

Table 1. Determination of the percentage of Vibrio

Pangkat	Vibrio		
	Yellow	Green	Flame
10 ⁰	0%	0%	0%
10 ¹	0%	10%	50%
10 ²	0%	30%	50%
10 ³	20%	50%	100%
10 ⁴	30%	75%	100%
10 ⁵	50%	75%	100%
10 ⁶	75%	75%	100%
10 ⁷	75%	100%	100%
10 ⁸	75%	100%	100%
10 ^{x>9}	100%	100%	100%

Source : PT. Lombang Sumber Rejeki

3.3 Necrosis hepatopankreas

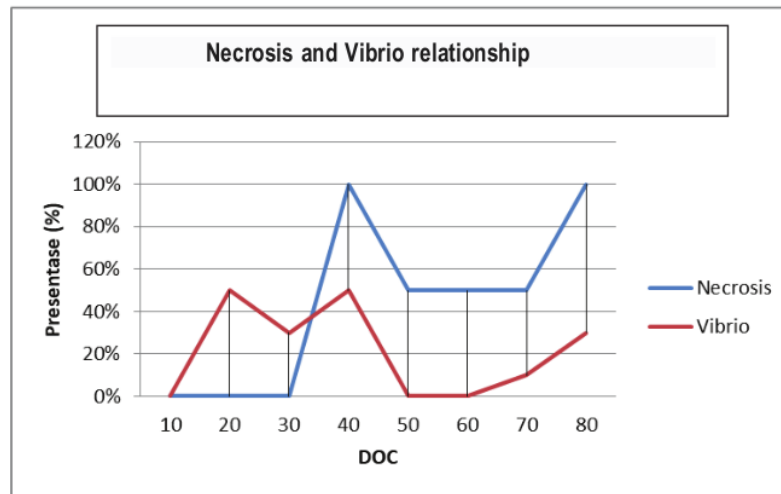


Figure 5. Necrosis and Vibrio relationship

Based on regression analysis, it is known that the significant value is 0.69, where the results are more than the significance level ($\alpha = 0.05$), so it can be concluded that there is no significant relationship significant difference between the percentage of vibrio and the incidence of necrosis. Influence the percentage of vibrio to necrosis is 2.8%, and get the influence of 97.2% by other factors. Graphically it is found that the increase in the percentage of vibrio does not coincide with the increase the incidence

of necrosis in the hepatopancreas tubules of shrimp.

Therefore, it is suspected that *Vibrio* hepatopancreas does not provide significant effect on the incidence of necrosis because the population *Vibrios* in hepatopancreas are still classified as safe or not yet capable have a pathogenic effect on white shrimp. Hammed *et al* [6] states that the increase in organic matter content comes from feed and feces trigger the acceleration of *Vibrio* development into pathogens opportunistic. The condition of hepatopancreas necrosis can be seen in Figure 6.



Figure 6. Determination of the condition of hepatopancreatic necrosis

Hepatopancreas necrosis is cell damage caused by pathogenic and non-pathogenic such as metabolic disorders, toxic effects and others. Putri *et al* [7] stated that necrosis caused by biological agents such as viruses, bacteria, fungi and parasite. The occurrence of necrosis in the hepatopancreatic tubules begins with inflammation that resembles reddish patches later will get bigger and darker. According to the statement Soegianto *et al* [8] that the necrosis that appears is usually characterized by with the accumulation of epithelial cells in the tubules and the color of the cells in the tubules darken.

3.4 Hepatopancreatic microvilli

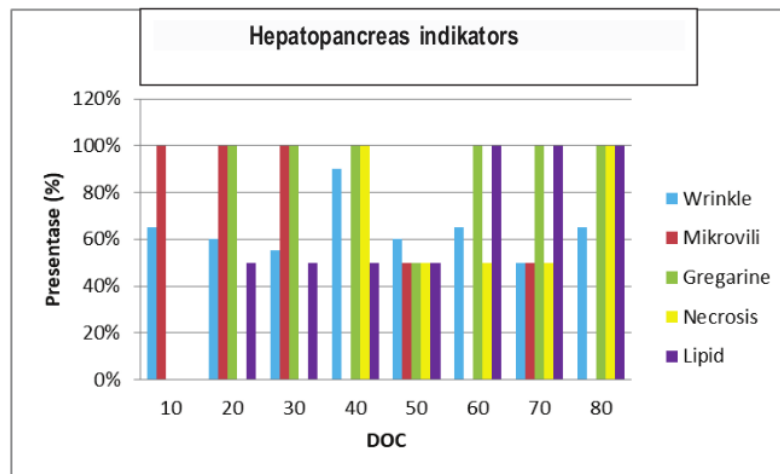


Figure 7. Hepatopancreas testing indicators

Based on the analysis of the regression model, it is significant because the test results ANOVA shows a value of 0.0209, where the result is less than significance level ($\alpha = 0.05$). However, from the 3 variables there are two variables that do not significantly affect the variable microvilli, namely gregarine and lipid variables, where the results of the P-value of the gregarine variable (0.685216) and the lipid variable (0.336822) which more than ($\alpha = 0.05$). As for the effect of the combination of events necrosis, gregarine and lipid on microvilli conditions by 81.1% and get an influence of 18.9% by other factors.

Microvilli are layers that line the hepatopancreas tubules. Microvilli damage is characterized by shrinkage of the microvilli or sloughing of the microvilli occurs. The microvilli good will be conical and not curly. On condition Good microvilli indicate normal digestive absorption function. In accordance with the statement of Zeng et al. [9] which states that The hepatopancreas in crustaceans is a digestive organ, which has an important function, mainly as an absorption organ characterized by the presence of microvilli cells which exhibit an absorption function and enzyme secretion. The degree of damage to the microvilli can be seen in Figure 8.

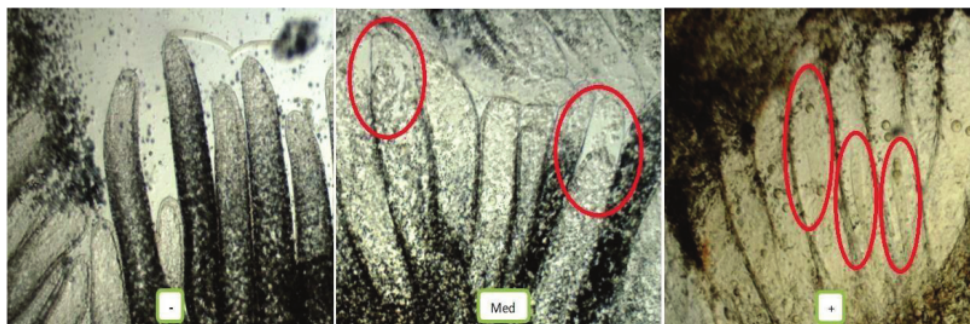


Figure 8. Determination of the condition of hepatopancreatic microvilli

The occurrence of necrosis causes damage to the microvilli, Microvilli that have decreased in quality will look wrinkled because the process of absorption of food does not run normally. In accordance with the statement of Putri et al [7] which stated that necrosis is acute cell damage and can be focal or massive. resulting in the network is not formed intact anymore because complete shrinkage or shrinkage of the nucleus.

Lipids in hepatopancreas do not have a significant effect on hepatopancreatic microvilli. This is presumably because the condition of the microvilli is decreasing day by day, while the percentage of lipids that has increased due to feeding which is increasing with increasing DOC cultivation.

The gregarine population does not have a significant effect on hepatopancreatic microvilli. This is presumably because the population gregarine has not been able to have a significant negative impact

hepatopancreas significantly, in other words the gregarine population still in a relatively safe population.

3.5 *Wrinkle hepatopancreas*

Based on all the hepatopancreas indicator data obtained, The results of the Regression model analysis are significant because the results of the ANOVA test shows a value of 0.0149, where the results are less than the level of significance ($\alpha=0.05$). With the Regression equation $Y = 0.196X1 - 0.326X2 - 0.498X3 - 0.011X4$, where Y = wrinkle (%), $X1$ = gregarine (%), $X2$ = microvilli (%), $X3$ = lipid (%), and $X4$ = necrosis (%). As for the six existing variables, there is one variable that does not has a significant effect on the wrinkle variable, namely the variable necrosis, where the P-value of the necrosis variable (0.898) is more than of alpha (0.05). Based on the Regression analysis, it can be concluded that 92.2% of the variation that occurs in the Y variable can be explained by variable X , while the remaining 7.8% can be explained by the variable other. The hepatopancreas indicators can be seen in Figure 9.

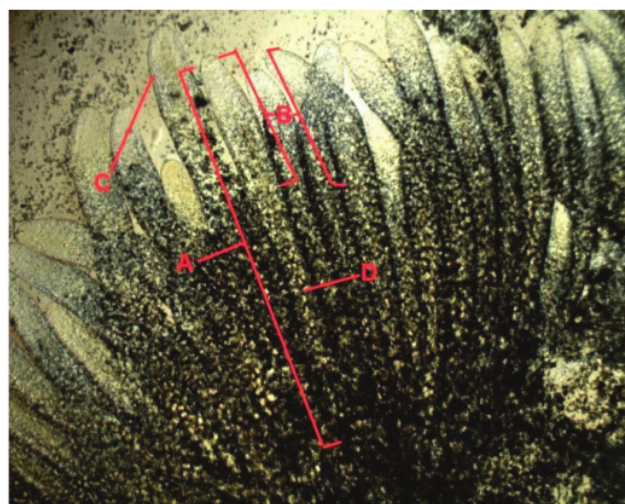


Figure 9. Hepatopancreas testing indicators. a. Hepatopancreatic tubules, b. hepatopancreatic wrinkle, c. Hepatopancreatic microvilli, d. hepatopancreatic lipids

Indicators that affect the value of hepatopancreas wrinkle are: necrosis, microvilli, gregarine and lipids. But necrosis has not have a significant impact on the percentage of wrinkle. This matter suspected because at the beginning of cultivation the hepatopancreas condition did not Necrosis was found because the water quality and so on were still deep optimum condition, but most of the wrinkle percentage has been influenced by the dominance of natural feed types at the beginning of cultivation which resulting in a high percentage of wrinkle.

Lipids in the hepatopancreas that are influenced by the type of food predominance shrimp will have an

impact on the percentage of wrinkle. As for the determination wrinkle percentage based on group percentage comparison lipids to the total length of the hepatopancreatic tubules. Microvilli condition have a significant effect on the percentage of wrinkle. Microvilli are related to the absorption function in the digestive system on the hepatopancreas. Good microvilli conditions cause the lower percentage of wrinkle due to absorption function on hepatopancreas tubules run normally, so the results of the system digestion (lipid) can be assumed as the percentage of wrinkle.

Gregarine in the hepatopancreatic tubules will affect absorption nutrients that affect the results of the absorption of the digestive system in the form of lipids, this will certainly affect the percentage Wrinkles in the hepatopancreatic tubules. Lightner [10] states that gregarin is said to have a negative impact on the hepatopancreas of shrimp, These organisms interfere with the absorption of nutrients so that it will affect disruption of shrimp growth. As for the cause of the decrease microscopically observed lipids over a period of time, showed a decreasing lipid condition along with increase in the length of time the test is carried out. It is suspected gregarine can absorb nutrients from its host, one of which is in the tubules hepatopancreas.

4. Conclusions

Based on the results of the analysis obtained in this study, it can be concluded that the conditions on the lipid indicators, gregarine, and microvilli significantly affect the percentage of wrinkle, as for the incidence of necrosis in hepatopancreas does not affect the percentage significantly wrinkled. Lipid condition is influenced by the average daily feeding (F/d) significantly. Combination between *Vibrio* and F/d (average daily feed) have a significant effect on significant effect on the gregarine population in the hepatopancreatic tubules. The incidence of necrosis has a significant effect on the condition microvilli because it is associated with impaired absorption function food in the hepatopancreatic tubules. In the event of necrosis hepatopancreas did not have a significant effect on population of *Vibrio* in the hepatopancreas, it is suspected that there are other factors that affect necrosis of the hepatopancreas.

After doing this activity, it is recommended that when planting bacteria, additional dilution is required if accumulation occurs colony, so that the results of the count are more reliable and to facilitate the calculation of bacterial colonies on Petri dishes. On hepatopancreas testing should be performed staining and administration of preservation solution so that the observation of each hepatopancreas indicator looks clearer.

5. References

- [1] Snieszko S F 1974 *J. Fish Biol.* **6**(2) 197-208.
- [2] Rijal A 2011 *Histologi Insang dan Hepatopankreas pada Udang Windu (Penaeus monodon) yang Dipapar dengan Logam Cu* Thesis Fakultas Ilmu Kelautan dan Perikanan (Makassar: Universitas Hasanuddin).
- [3] Lembang Sumber Rejeki Sumenep 2021 *Standar Operasional Prosedur (SOP)* (Sumenep: PT. Lembang Sumber Rejeki Sumenep)

- [4] Arief T 2017 *Petunjuk Teknis Pengendalian Penyakit Berak Putih (White Feces Disease, WFD) Pada Udang Vaname di Tambak* (Jepara: Balai Besar Perikanan Budidaya Air Payau (BBPBAP) Jepara).
- [5] Kua B C, Salleh M T, and Noraziah M R 2013 *Pertanika J Trop Agric Sci.* **36**(3) 217-224.
- [6] Hamed A S S , Rahaman KH, Alagan A, and Yoganandhan K 2003 *Aquac.* **217**(1-4) 39-48.
- [7] Putri A M, and Prayitno S B 2015 *JAMT.* **4**(4) 141-149
- [8] Soegianto A, Adiani N P and Winami D 2004 *Berk. Penelit. Hayati.* **10** 59-66.
- [9] Zeng H Y, Haihui L, Shaojing, and Wang G 2010 *In Vitro Cell. Dev. Biol. Animal.* **46** 431-437.
- [10] Lightner D V 1996 *J. Aquat. Anim. Health.* **14** 57-64.
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