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Effectiveness Microkapsul Feed Enriched Maggot Flour (Hermetia Illucens) on the Growth of Saline Tilapia (Oreochromis Niloticus) to Increase People's Income

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Abstract

The purpose of the study was to determine the growth of saline tilapia fed artificial feed in the form of microcapsules enriched with protein in the form of magot flour, which has a standard composition for fish growth in general. The research method used was a completely randomized design with 4 treatments and 3 replications. In this study, the time intervals for treatment were: A (feeding every 2 hours), B (feeding every 4 hours), C (feeding every 6 hours), D (feeding every 8 hours). The results showed that the highest average growth was obtained in treatment B with an interval of 4 hours, the increase in biomass reached 11.57 grams. While the lowest growth was obtained in treatment D at an interval of 8 hours resulting in an average growth of 3.56 grams. The results of the analysis of variance on the growth of saline tilapia biomass showed that the calculated F value was greater than the F table 1% and 5%. This shows that artificial microcapsule feed can be consumed quite well, on a laboratory scale. This was also proven in the Tukay test which showed a difference in the effect of microcapsule feed given at different time intervals. In addition, there are supporters in the maintenance of the research, namely water quality, including temperature during the study between 270C – 290C, water pH ranging from 6.5 - 9, and water salinity during the study between 0 - 30 ppt.

Keywords
effectiveness; microkapsul; hermetia illucens; oreochromis niloticus; increase people's income

I. Introduction

Has good prospects for development, much favored by the public because the meat is quite thick and has a savory taste. Its high protein content can be used as a source of protein for human health. Saline tilapia is a strain of tilapia that is tolerant of brackish and marine waters with high salinity reaching 0-35 ppt (BPPT, 2011). Demand for saline tilapia by the public is increasing, it is necessary to pay attention to aquaculture production. In order to support the cultivation business, and reduce the amount of production costs, the aspect that plays a role is feed. So it is necessary to do feed that can provide hope for cultivators magot, layur fish and chicken eggs. These ingredients are high in protein which is sufficient for the growth of salted tilapia. This is in accordance with the theory which states that saline tilapia feed needs complete feed ingredients as high nutrients (Akbar, 2000), it can even reach 60-70% of the total cost of cultivation production (Effendie, 1979). Meanwhile, the price of aquacultured fish is still relatively low, and the cultivators' profits are low. In an effort to improve the growth rate of fish properly and the survival rate of fish and the efficiency level of fish feed utilization is good, then engineered feed manufacture is carried out, but can provide nutrients to support its growth.

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According to Akbar (2000), artificial feed for fish must meet the needs for growth. So the feed given through homemade formulations must be adjusted, in order to support optimal growth. And feed must have protein, carbohydrates, fat, vitamins, and minerals. The feed in this study was made from materials that came from the environment, had the appropriate content for the formulation of feed for fish. The ingredients for the formulation include free-range chicken eggs, cut chicken (lehor), magot animals, and layur fish. These raw materials can be made into microcapsules that can be used for fish fry and shrimp larvae. This feed is expected to have a positive impact on fish cultivators in both fresh and brackish water fish and shrimp. For cultivators by mixing feed ingredients, milled manually then can be formed with a simple grinder. For the size can be adjusted to the type of fish to be cultivated, the feed can be reduced by using a blender and then filtered. By providing a good formulation, it will be able to support growth in accordance with the expectations of cultivators and provide benefits which of course have an impact on the family becoming prosperous.

The benefit of this study was to determine the optimal time frequency and the effect of using microcapsule feed with a combination of maggot flour on the effect of optimal fish growth results.

II. Review of Literature

Tilapia belongs to the group of tilapia relatives and is invasive when it comes off public waters. Have high adaptability and tolerance for quality water, can live in extreme environmental conditions. Its habitat is in freshwater, such as rivers, lakes, reservoirs, swamps, rice fields and irrigation canals, but has a wide tolerance for salinity so that tilapia can live and breed in brackish waters with a preferred salinity of between 0-35%. Freshwater tilapia can be transferred to brackish water, with a gradual adaptation process, small tilapia 2-5 cm, more resistant to environmental changes than older fish.

In their natural habitat, tilapia consumes plankton, periphyton, and soft plants, such as *Hydrilla* and algae, including omnivores but tend to be herbovores. Saline tilapia cultivators use artificial feed (pellets) with protein content between 20%-30%. (Kordi and Ghufran, 2009). And tilapia is very responsive to artificial feed (pellets) both floating pellets and sinking pellets (Cholik, 2005). Feeding can be done 3-4 times a day, namely in the morning, afternoon, evening, and at night. The amount of feed given to fish measuring 1-2 cm is about 4-6% of the total body weight of the fish (Kordi and Ghufran, *2010*).

Based on the size of the fish that are still in the state of the seeds, the feed can be engineered, namely in the form of microcapsules, which are made with natural ingredients that are easily and cheaply obtained in the surrounding environment, namely in Indonesia. Artificial microcapsule feed can be made manually using egg-based ingredients and other protein additives.This is in accordance with the statement, microcapsule feed with protein matrix and water suspension media can be filled with *tubifex sp*, and the size is 50 nm –2.0 mm, so it can be used as artificial feed for larvae in both fish and shrimp (Sukardi *et al.*, *2007*).

Therefore using maggot animals that are still larvae, and contain protein ranging from 41-42%, ash 14-15%, Calcium 4.18 5.1% and 0.60 - 0.63 phosphorus in dry form (M Ambari, 2020) can be used as material to enrich protein in fish feed. And the very small form of maggot (flour) then it can be used as raw material for engineered feed in the form of microcapsules.

According to Yufera *et al* (1999) Microcapsule feed must be easily distributed, because at the beginning the larvae are still not actively moving (limited movement), and must be able to be caught before falling to the bottom of the pond. A good microcapsule has a low density of 400 – 600 g/l with an average sinking rate of 25 cm/hour. Its presence must float/float in the rearing medium, so that it will be easily caught by shrimp or fish larvae.

Feed microcapsules are spherical particles with sizes ranging from 50 nm to 2 mm composed of a polymer matrix on the outside (excipient) as a wall and an active component on the inside (incipient) as the core substance, Arshady, *1989 in* Hana, *2009*.

III. Research Method

The research was carried out on June 1 – July 10, 2021 (40 days) at the Pekalongan University Laboratory. The test fish used were saline tilapia with a size of 2.0-3.0 cm, microcapsule feed, enriched with maggot flour. This research was conducted using the experimental method*in*the laboratory. The design used was a completely randomized design (CRD) with four treatments and three replications. The treatments used were: Feeding time intervals, including A = feeding with an interval of 2 hours, B 4 hours, C 6 hours, and D8 hours. Parameters observed were growth which included weight growth, survival rate (SR) and supporting research, namely water quality in this study.

Growth of Absolute Weight The growth of weight is calculated using the formula according to Weatherley (1972) as follows:

$$W = W_t - W_0$$

Information:
W = Growth in absolute weight (g)
Wt = Weight of fish at the end of rearing (g)
W0 = Weight of fish at the beginning of rearing (g).

Life pass (SR)

The survival value is calculated using the formula from Effendi (1997) as follows:

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

Information:
SR = Survival rate (%)
Nt = Total number of live fish until the end of the study
No = Total number of fish at the beginning of the study

IV. Results and Discussion

Growth data of saline tilapia fish samples for measurement of absolute fish biomass were carried out every ten days for 40 days. The measurement results can be seen in the table below.

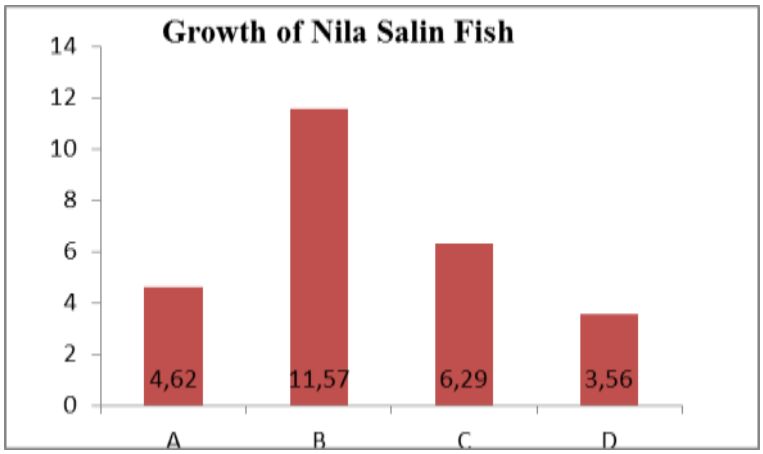
Table 1. Growth Data for Tilapia BiomassCopy

TEST	TREATMENT				TOTAL
	A	B	C	D	
1	04.57	0,44	0,26	02.55	
2	03.38	0,59	06.43	0,14	
3	0,27	0,48	0,29	05.28	
TOTAL	0,6	34.71	0,80	0,46	78.07
AVERAGE	0,209	11.57	06.29	03.56	

Description:
A: Feeding with a time frequency of 2 hours
B: Giving packs with a frequency of 4 hours
C: Giving clothes with a frequency of 6 hours
D: Giving clothes with a frequency of 8 hours

Results of periodic data analysis on the growth of saline tilapia seeds increased every ten days. The highest average biomass growth in saline tilapia fry was in treatment B in treatment (time interval) 4 hours with an average fish of 11.57gr, then in treatment C (6 hours) with an average fish of 6.29gr, then in treatment A (2 hours) with an average fish of 4.62gr, then in treatment D with a treatment time of 8 hours with an average fish of 3.56gr.

The histogram of tilapia seed biomass growth is as follows



The normality test results obtained from the average absolute biomass growth during the study showed that the data were normally distributed and then continued with the homogeneity test and produced homogeneous data, then the data continued to be analyzed for variance (ANOVA). Based on the analysis of variance that has been listed and table (2) below, it is found that the calculated F is 15.03> F table 1% is 5.99. This means that there is a very significant difference in influence between treatments.

Table 2. Analysis of Diversity Print Data

SK	DB	JK	KT	F Count	F Table	
					5%	1%
Treatment	3	113,923	37,974	18,930**	2,210	3,090
Error	8	16,055	2,007			
Total	11	129,978				

Information:
___** Very Significantly Different

Based on the results of analysis of variance data shows the calculated F value of 18.93, which is greater than F table 5%, which is 2.21 and F table 1%, which is 3.09. It can be said that the treatment with time intervals of 2 hours, 4 hours, 6 hours, and 8 hours is very significantly different. . Furthermore, the Tukey test is presented in table (3) as follows.

Table 3. Tukey Test Results

Treatment	Average	B	C	A	D
B	11,57	_			
C	6,28	5.29**	_		
A	4,61	6.96**	1.67ns	_	
D	3,55	8.02**	0.73ns	1.06ns	_

Information:
___**: Very Significantly Different
___ns: Not Significantly Different

The results of the Tukay test showed the highest value for growth was obtained in treatment B, very significantly different from treatments C, A, and D. The weight growth diagram of fish B with a treatment time of 4 hours showed the highest increase in weight with an average of - average 11.57gr. Meanwhile, the lowest growth was found in the 8 hour time interval treatment with an average of 3.56gr. This shows that the effect of time has an impact on the growth of Nila Salin fish.

4.1 Life calulus (SR)

The life pass of saline tilapia in this study was quite good in the sense that there were no deaths during the study. This means that the time interval treatment and the nutrition of the feed provided have met the standards for saline tilapia. (FAO, 2014). The feed given had a protein content of 37.55, crude fiber 12.00, fat 15.75, ash 14.33, carbohydrates 20.55, dry weight 91.45 and water content 9.55 in 100 g of feed. Stocking density, feeding, and supporting water quality for maintenance include salinity, temperature, dissolved oxygen levels, and water pH. It was stated that the survival of saline tilapia was not significantly

different in waters with a salinity of 0 ppt to 30 ppt, this condition was caused by euryhalin. (Kordi and Tanjung (2007)

Table 4. Measurement of Water
Parameter Results Comparative Observation

Parameter	Observation result	Comparison
temperature	27-29^{0}C	>24^{0}C (Kordi and Tanjung (2007)
pH	7,5 ppm	6,5-9 ppm (Kordi and Tanjung (2007)
DO	5 mg/L	< 5 mg/L (Kordi and Tanjung (2007)
Salinitas	10 ppm	0-30 ppm (Kordi and Tanjung (2007)

Good water quality is a very important factor in the survival of saline tilapia, especially for growth.

4.2 Economic Value for Cultivators

Based on the research results obtained, there are improvements in aquaculture, due to good efficiency in the use of feed that is given regularly, in terms of feed, the proximate value of feed is obtained that meets feed that can be used for maintenance in fish hatcheries. As a comparison, microcapsule feed given to fish seeds that were not given magot growth was less than / smaller, and the time was longer enough. So as a solution for microkaosul with the addition of magot, it is more efficient in terms of time and growth. Karen magot has protein content ranging from 41-42%, ash 14-15%, Calcium 4.18 5.1% and 0.60 - 0.63 phosphorus in dry form (M Ambari, 2020) can be used as ingredients to enrich protein in fish feed which is quite good, especially in laerav and fish fry. Besides providing faster growth, it will also support the graduation of life, as well as fish health. Thus, healthy fish will have an impact on cultivators in production, and also have a fairly good selling value. Production that can be obtained by cultivators include:

Healthy fish seeds, and in post-harvest fish that have quite high levels, because feed with microcapsules has the carrying capacity for growth so as to provide good support for cultivators, and will increase economic value for farmers.

The economic condition of the population is a condition that describes human life that has economic score (Shah et al, 2020). Economic growth is still an important goal in a country's economy, especially for developing countries like Indonesia (Magdalena and Suhatman, 2020).

Thus feed in the form of microcapsules that use magot animals can provide benefits for cultivators and become a reference in rearing fish larvae and fry for optimal production. This is in accordance with the opinion. (Sukardi et al., 2007). that the artificial feed given must be able to be used as artificial feed for both larvae and fish fry and if possible also on shrimp. (Sukardi et al., 2007). And the feed must also be distributed properly so that it will provide a healthy environment and the fish grow optimally, because this is what is needed for its users. Feed will clearly affect production and profits for farmers.

There is information on fish cultivators, namely about sufficient fish feed expensive, it really needs support for cultivators. The artificial feed used as microcapsules is made from materials that are easily available in the environment, and the price is very cheap. So

for cultivators, they can make their own in a traditional way, only with ingredients such as fine bran, (bran) maggots, eggs, vitamins, tapioca flour and the addition of oil. Traditionally processed with a simple milling machine, the processed product is then dried in the sun, it can be in the form of fine pellets. This situation clearly provides farmers without having to buy feed for fish cultivation. This is very supportive to reduce expenses in purchasing feed for its production. With self-made feed, it can also be according to their needs, meaning that it can be made when it is needed, so that the condition of the feed is always in good and healthy condition and there is not a lot of leftover feed that requires a special storage area. In addition, cultivators also always have experience with making their own feed, and will increase its production continuously, and the development of economic value is also always increasing, and it is also possible for farmers to expand their fishery production business. In addition, farmers will compete in an effort to increase the fish obtained in economic value, because they can go to a wider market, this will certainly have a better economic impact.

V. Conclusion

The highest average growth was obtained in treatment B with an interval of 4 hours, the increase in biomass reached 11.57 grams. While the lowest growth was obtained in treatment D at an interval of 8 hours resulting in an average growth of 3.56 grams. The results of the analysis of variance on the growth of saline tilapia biomass showed that the calculated F value was greater than the F table 1% and 5%. This shows that artificial microcapsule feed can be consumed quite well, on a laboratory scale. This was also proven in the Tukay test which showed a difference in the effect of microcapsule feed given at different time intervals. In addition, there are supporters in the maintenance of the research, namely water quality, including temperature during the study between 270C – 290C, water pH ranging from 6.5 - 9, and water salinity during the study between 0 - 30 ppt.

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