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INFLUENCE OF FISH FEED AND DIFFERENT SALINITY LEVEL TOWARDS GROWTH OF STADIA GLASS EEL (*ANGUILLA BICOLOR*)

Sa'idah Nur Fitrotus*, Andayani Sri, Yanuhar Uun

Department of Aquaculture, Faculty of Fisheries and Marine Science,
University of Brawijaya, Indonesia

*E-mail: nurfitrotuss@gmail.com

ABSTRACT

Eel (*Anguilla* sp.) is a type of fish that has high price point. It has been cultivated using both intensive and extensive cultivation system more particularly in Asia. However, mortality of the fish seed, more particularly during early cultivation stage, is still high. Objective of this study was to describe fish feed and salinity in order to optimize the fish growth. The size of the fish seed was between 3 and 5 centimeters. The seeds were kept in controlled container for 15 days. The density was 5 fish/liter and the salinity levels were 0 ppt, 5 ppt, 10 ppt and 15 ppt. The fish was fed with 5% of the total biomass of silkworm and paste twice a day. The observed parameters were quality of water consisting of pH, temperature, DO, ammonia, nitrate and nitrite. The finding showed that amylase enzyme activities reached the highest level when the salinity level was 5 ppt and the fish was fed with silkworm (natural fish feed).

KEY WORDS

Anguilla sp., salinity, fish feed, growth, glass eel.

Eel is a type of catadromous fish that requires certain level of salinity to survive. In addition, salinity is one of the factors that affect metabolism and enzyme activity in fish. Boeuf and Payan (2001) stated that salinity can affect activity of enzymes responsible for digesting food. Suitable salinity level will increase enzyme activity and at the opposite, inappropriate salinity level will decrease the enzyme activity. Effective metabolism and enzyme activity will produce energy fish needs to grow.

Growth is an important parameter of cultivation while survival is the parameter used to determine level of production. Growth is closely related to food because nutritious food will accelerate growth. Availability of natural fish feed has significant role in seed stadia. On the other hand, intensive cultivation requires artificial fish feed. Artificial fish feed can be manipulated as needed and in order to improve its quality. Artificial fish feed may consist of ingredients from plant and animals. Artificial fish feed producers should pay attention to nutrient content and size of fish that will consume the fish feed. Other parameters beside fish feed that affect eel growth are temperature, pH, dissolved oxygen, alkalinity and salinity (Anabela, *et al.*, 2016).

The environment affects physiology, growth and survival condition of fish. In this context, the environment refers to salinity in which salinity influences physiology and biochemistry in fish growth. Salinity and temperature have complex interaction in controlling osmoregulation and growth. This process is also controlled by some active hormones and digestive enzymes. Osmotic balance is an external factor in aquatic biota growth (Liu, 2013).

Biomass is an element fish farmer should take into account in selecting fish feed. Suitable percentage of fish feed will accelerate fish growth. In this study, it can be concluded that type of fish feed has significant influence towards fish growth. Suitable type of fish feed will optimize the growth of eel seeds (Fekri, *et al.*, 2014).

METHODS OF RESEARCH

Experimental study is type of research in which researchers manipulate one or more variables using particular methods; this method will influence the manipulated variables and also other variables. The manipulated variable is called independent variables while

dependent variable is a variable that depends on the independent variables (Setyanto, 2005).

Factorial design is a design in which one or two treatments are simultaneously tested. Factors commonly found in this design are genotype factors and site factors. The advantage is to describe influence of each factor and its combined effect (Zaki, et.al, 2014).

Code K: control (0 ppt and natural fish feed)

Code A: type of fish feed

Code B: salinity

Codes 1, 2, 3: different type of fish feed and salinity

Codes a, b, c: replication

Figure 1 – Research plan used in this study

Observations towards size (weight and length) of the samples were conducted every three days and the results were accumulated at the end of the observations to measure Sustainable Growth Rate (SGR). Quality of water is observed every day. Proximate test was conducted to describe nutrient content in the fish feed. The water is changed periodically in order to maintain its quality and provide suitable medium for the fish to grow.

RESULTS AND DISCUSSION

Growth of fish can be improved through selection, hybridization and genetic engineering. Among the three, genetic engineering is the most difficult method to improve fish growth due to the lack of gonad ripening, larval maintenance and spawning techniques researchers have (Tanaka, 2006).

Alatise and Effiong, 2013 stated that Specific Growth Rate (SGR) is daily growth rate of which formula is as follows:

$$SGR = \frac{(\ln W_f - \ln W_i) \times 100}{\text{Time}}$$

Where: SGR = daily growth rate (gram/ day); W_f = average weight during treatment (gram); i = average weight in the beginning of the treatment (gram); Time = duration of treatment (day).

Based on the analysis towards the Sustainable Growth Rate (SGR), the most suitable salinity was 5 ppt and the most suitable fish feed was silk worm (*Tubifex* sp.). It happened because the other salinity levels or fish feed did not support the fish metabolism. As the result, the fish could not digest their food well and spent most of their energy to adjust to their environment.

Based on the proximate analysis, natural fish feed (*Tubifex* sp.) had better protein, fiber and fat content than the artificial one (paste). It showed that natural fish feed works more effectively to accelerate the fish growth.

Table 1 – Result of SGR Statistical Analysis

Code	Salinity	Fish Feed	Result
K	0 ppt	Silk worm	0.21±0.050 ^{bc}
A1B1	5 ppt	Silk worm	0.33±0.042 ^c
A1B2	10 ppt	Silk worm	0.32±0.035 ^b
A1B3	15 ppt	Silk worm	0.21±0.036 ^a
A2B1	5 ppt	Paste	0.17±0.006 ^c
A2B2	10 ppt	Paste	0.05±0.010 ^b
A2B3	15 ppt	Paste	0.05±0.000 ^a

The result showed significant difference ($P>0.05$); average $\pm$ STDEV.

Figure 1 – Comparison of Growth Rate Percentage

Table 1 – Results of Proximate Analysis on the Fish Feed

Fish Feed	Nutrient Content				
	Dry Ingredient (%)	Ash (%)	Crude Protein (%)	Crude Fiber (%)	Crude Fat (%)
Paste	97.61	19.43	41.77	0.51	8.77
Silk Worm	10.99	7.96	56.80	0.65	15.71

*) per 100 milligrams of sample.

Table 2 – Quality of Water and the Standardized Scores

Parameter	Observation	Standardized Score
DO	5.01 - 7.73 mg/l	>4.5 mg/l
Temperature	27 - 30°C	23-30°C
pH	7.5 - 8.5	7.0-8.5
Ammonia	0.50 - 1.0 mg/l	<1.0 mg/l
Nitrite	0.1 - 0.2 mg/l	<0.2 mg/l
Nitrate	0.5 - 2.0 mg/l	<2.0 mg/l
Salinity	5, 10, 15 ppt	5, 10, 15 ppt

During the treatment, the quality of water was observed periodically. The observations showed that the water was safe for aquatic organism. Table 2 described the observation results towards the water quality.

CONCLUSION

Based on the findings, it can be concluded that the most suitable level of salinity for eel (*Anguilla bicolor*) is 5 ppt and the most suitable natural fish feed for the fish is silk worm (*Tubifex* sp.).

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