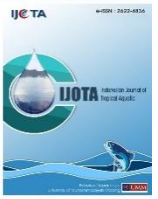
Contents lists available at UMM Scientific Journal

IJOTA

Indonesian Journal of Tropical Aquatic

Journal homepage: http://ejournal.umm.ac.id/index.php/ijota



Meat bone meal and poultry by-product test on granule towards the growth and survival rate of eel, *Anguilla bicolor* elver stage

Triana Indri Astuti[1*], Hany Handajani[1], Riza Rahman Hakim[1]

Fisheries Department, Faculty of Agriculture and Animal Science, University of Muhammadiyah Malang, Indonesia.
*Indrinji@gmail.com

https://doi.org/10.22219/ijota.v1i1.5855

ABSTRACT

This research was conducted at Hatchery Fishery Laboratory in University of Muhammadiyah Malang. The aim of this research was to identify the meat bone meal (MBM) and poultry by-product (PBM) test on granule and the best treatment to the growth and survival rate of Eel (*Anguilla bicolor*) stadia elver. The method used Completely Randomized Design (RAL) with 3 different treatments on granule composition, P1 (Commercial Granule), P2 (70% Commercial Granule and 30% MBM), P3 (70% Commercial Granule and 30% PBM), and each treatment was repeated three times experimentally. Furthermore, the data were analyzed by ANAVA and continued with BNT test. The results indicated that MBM and PBM test on granule had a significant effect on the absolute growth rate, a very significant effect on DGR, and not significantly different on Eel. The absolute best growth rate was on P2 2.24 ± 0.71. The best DGR was on P1 (5.55 ± 0.33). Based on the research results, it was concluded that feeding the granule based on meat bone meal increased the growth and survival rate, and also could be the substitution granule for Eel (*A. bicolor)*.

Keywords: Eel (*Anguilla bicolor*), Growth rate, MBM, PMB, Survival rate.

1. Introduction.

Eel is export commodity that has high economic value and be able to compete other commodities in the international market to produce the country's foreign exchange. The increase of international market demand for Eel will also affect to the higher selling price. Granule is the most significant factor that influences to the growth of Eel. The granule quality can stimulate the growth of Eel well. The main source of protein used by the granule fish industry is fish meal (50-70%) and also as the main source of essential minerals especially calcium and phosphorus (Abdiguna, 2013).

The increasing demand of fish meal causes problem in its availability which affects to the higher selling price of Eel. In addition, the high price of fish meal affects to the higher selling price of commercial granule sold in the market. It will certainly affect to the increase in production costs, because it is mostly influenced by the use of commercial granule that also effect on the business sustainability of fish farmers.

The use of granule was based on raw materials with a relatively low price and its quality which is close to fish meal as the replacement materials to be the solution to overcome the problem. One of them is using MBM and PBM. Therefore, the research on the growth of Eel (*A. bicolor*) using MBM and PBM is necessary to be conducted.

2. Materials and Methods

This research was conducted on February 15, 2018 - March 17, 2018 at the Fishery Laboratory in University of Muhammadiyah Malang. The research method used Completely Randomized Design (RAL) with 3 different treatments on granule composition, P1 (Commercial Granule), P2 (70% Commercial Granule and 30% MBM), P3 (70% Commercial Granule and 30% PBM), and each treatment was repeated three times.

2.1. The Experimental Fish

In this study used 60X30X20 cm aquarium filled with 20L of water. Nine aquariums was filled with 20 Eels with the average weight 7g each aquarium. The experimental fish was brought from Cilacap and acclimatized in fiber tin for 2 months by feeding the granule at twice/day. The early weight was measured and transferred into the experimental aquarium which was fasted for 24 hours to keep the remaining feed contained in the body lost**.**

2.2. The Experiemntal Granule Preparation

The experimental granule used P1: matrix granule (100% grouper granule), P2: the experimental granule I (70% grouper granule and 30% MBM granule), P3: the experimental granule II (70% grouper granule and 30% PBM granule). The results of the proximate analysis of the experimental granule were presented in Table 1.

Table 1. Nutrition Content of Granule Treatment

	Treatment		
Component	**P1**	**P2**	**P3**
Water contents (%)	5,93	7,21	7,75
Ash (%)	17,00	17,70	14,36
Protein (%)	48,00	47,91	48,27
Crude Fat (%)	12,00	13,81	12,39
Crude Fiber %	2,00	3,39	1,86
BETN (%)	15,07	9,98	15,37
GE (kkal/100gr)	443,387	439,028	449,795
C/P (kkal/gram)	9,24	9,16	9,32

2.3. Data collection

Parameters was measured in this study including the absolute length growth, day growth ratio, and survival rate. Water quality was observed in the study including oxygen, temperature and pH. The formulas of each parameter were as follows:

The Absolute length (cm): Lm = Lt - Lo

Lm = the absolute length growth (cm)

Lt = the average length of the fish before treatment (cm)

Lo = the average length of the fish after treatment (cm) (Effendi, 1979)

Day Growth Ratio (gr): DGR = $\frac{Wt-W0}{t}$

DGR = Daily growth rate (gram/hari)

Wt = the fish weight at time t measurement (gram)

Wo = the fish weight at initial measurement (gram)

t = Measurement time during sampling (Effendi, 2004)

Survival Rate: SR = $\frac{Nt}{N0}$ x 100%

SR = Survival Rate (%)

Nt = Number of the fish living at the end of the study (tail)

No = Number of fish living at the beginning of the study (tail) (Effendi, 2004)

3. Results and Discussion

The absolute length growth rate data, day growth ratio and survival rate were shown in table 2.

Table 2. Growth and Survival Rate for 30 days

Parameter	***P1* Treatment**	**P2 Treatment**	**P3 Treatment**
PM (cm)	1,18±0,13[a]	2,24±0,71[b]	2,21±0,11[b]
DGR	5,55±0,33[c]	5,02±0,11[b]	3,60±0,22[a]
SGR	100±0	98,33±2,89	100±0

Different letters on each row showed the significant differences in each treatment ($p<0.05$) in PM (the absolute length), DGR (day growth ratio), SGR (specific growth rate). The highest score of PM, DGR, and SGR were showed by P2 treatment, P1 treatment, P1 and P2 treatment, respectively.

Table 3. Water Quality Parameters during Maintenance

Parameter	**Treatment**			**Optimal Range (ºC) (Priatna, 2013)**
	P1	**P2**	**P3**	
Temperature (ºC)	25-29	25-29	25-29	23-30
pH	7,0-8,0	7-8,1	7,-8,1	6,5-8,0
DO	3,5-6,0	3,8-5,9	4,1-7,2	>3

3.1. The absolute length growth

The highest absolute length growth of Eel was in P2 treatment with protein content of 47.91% (table 1). P2 had the lowest protein content compared to P1 and P3 treatment, but it obtained the highest absolute lengths growth rate.

These were influenced by the nutrition needed in P2 treatment sufficiently to be used as energy in metabolism activities which remaining energy could be used for its growth. According to Abdiguna et al. (2013), the adequacy and fulfillment of nutrition in the granule can provide energy for the fish's metabolism activities. The absolute length growth of Eel significantly increased in P2, while P1 was in the weight growth. This was supported by the statement of Arief (2011) that Eel in the elver phase experiences the length growth earlier to a certain length, then continued to the weights growth. This means that the fish in P1 treatment had experienced the absolute growth before conducting the research, so that when the research had begun and treated by P1 treatment, it faced

with the heavy growth. The quality granule was determined by high protein content. However, too high protein content did not guarantee the success of fish growth, because each fish had ability to digest different proteins. Therefore, the suitability to the use of raw materials with protein content for the fish was very crucial in determining the growth of fish. Based on Adelina et al. (2000, cited in Widaksi et al., 2014), the high growth and feed conversion could be obtained from the energy-protein balance and the right amount of feeding. The growth of Eel could also be influenced by internal and external factors. Internal factors include age, heredity, and ability to use food and disease resistance, while external factor is living media of fish (Giri, 1998 cited in Cholifah et al*.,* 2012).

3.2. Day growth ratio

The confidence interval of Eel 95% showed that the highest weight growth score was in P1 treatment because protein contained in P1 could be useful for the growth of the fish. The weight growth occurring in P2 was not really significant at 5.02 ± 0.11 which was higher than P3 treatment at 3.60 ± 0.22. The ration of P3 treatment had not been able to meet the nutrition needs of the fish, so that the energy produced by the granule was diverted to maintenance energy. This was supported by the statement of Lovell (1989) that protein is used as an energy source during metabolism activities. If the protein is not sufficient for the needs, then the growth will stop, and there is a decrease in body weight because the protein in the body tissue will be broken back to maintain the function of the body tissue which is more important (NRC, 1993). The composition of the ingredients as well as the nutrition value contained in each ingredient significantly influenced the growth of the fish. This was supported by Handajani et al. (2018) that the increase in weight growth is influenced by the quality and suitability of granule given. According to Dairi (2015), Granule for Eel contains 40-55% protein which is good for the growth. In terms of protein content in each treatment, P1 48.00%, P2 47,91%, and P3 48,27% were very sufficient for the protein needs, but in fact in P3 treatment that had the highest protein content had the smallest weight growth. It was because the fish was not able to digest the nutrition contained in the granule well. Most of the energy used for the growth was derived from proteins. Proteins are composed of both essential and non-essential amino acids. The ability to grow is influenced by the content of essential amino acids in the granule ingredient (Tyas, 2009). The quallity granule is influenced by the complete amino acid and the vice versa. The use of Eel towards granule is influenced by the suitability of the need for a combination of nutrition from fat, protein, water, fiber, and ash. According to Millamena et al. (2002), the quality of granule is determined by the nutrition content, because the fish will get energy efficiently from the use of granule. This was also supported by Murtidjo (2001) that the feeding levels and energy content influence the protein needs, while the capacity of the digestive tract affects the amount of feeding. The decrease of nutrition intake may occur if the fish need more protein energy in the body. Therefore, the proper balance between energy and protein is required to achieve the coefficient and effectiveness of granule utilization.

3.3. Survival rate

The study results obtained not significantly different ($p<0.05$) between survival rate treatments. This was proceed from the feed on each treatment which was able to provide nutrition to help maintain life. This was also supported by Rukmana and Rahmat (2003) that nutrition in granule eaten by fish are used for growth. According to Mulis (2015), the success rate of maintenance could be closed to 100% if the availability of granule can meet the needs of fish and not even dead or

missing. In order to maintain the growth and survival rate of fish, the need of granule that can meet the nutrition needs is needed. In fact, the nutrition of granule will be broken down into energy, then be utilized by fish in the maintenance of the body and also used for growth. Fats and proteins in the granule are the main source of energy that fish can harness to grow and maintain their tissues. The most significant factor in cultivation is the water quality parameter. In this study, the water quality was measured such as the dissolved oxygen, the degree of acidity (pH), and the temperature. Water quality data was shown in table 14. The analysis results showed that water quality values are relatively homogeneous between treatments and still within tolerable limits for the growth and survival rate.

3.4. Water quality

The temperature of water during the study was relatively stable at 25 - 29ºC, the value was good for the seed growth (*Anguilla sp.*). The growth of fish was not optimal due to the too high or too low temperature, so it did not meet the needs of temperature. According to Priatna (2013), the optimal temperature for the growth of fish was 23 - 30ºC. Also during the study, the pH ranges from 7.0 - 8.2 pH was beyond the good PH range value for the maintenance of the giant mottlet eel (*Anguilla sp.*). In another statement from Priatna (2013), the optimal pH for the maintenance of the fish was 6.5 - 8.0. However, the fish is still able to live well in that pH range. This indicated that giant mottlet eel could adapt to higher pH range. The dissolved oxygen content (DO) ranges was around 3.4 - 8.2 mg/l. This value is out of a good DO range. According to Mulis (2015), the dissolved oxygen which is good for the seed growth of Eel (*Anguilla sp.*) should be 4.0 - 8.0 mg/l. However, the fish could still live well, so this indicated that giant mottled eel could adapt to higher DO which than the tolerance value.

4. Conclusions

This study showed that MBM had the significant effect on the absolute length growth and survival rate of eel. However, PBM granule did not give any effect on the growth rate of either the absolute length, DGR and only affected to maintain the survival value without providing the significant changes in its growth.

References

Abdiguna A, Limin S, Wardianto, Suparmono. 2013. *Penggunaan Tepung Daging dan Tulang sebagai Sumber Protein Hewani pada Pakan Ikan Nila Merah (Oreochromis Niloticus).* E-JurnalRekayasa dan Teknologi Budidaya Perairan. Vol. 2

Arief, Pertiwi DK, Cahyoko Y. 2011. *Pengaruh Pemberian Pakan Buatan, Pakan Alami, dan Kombinasinya terhadap Pertumbuhan, Rasio Konservasi Pakan dan Tingkat Kelulushidupan Ikan Sidat (Anguilla bicolor)*. (Jurnal) Fakultas Perikanan dan KelautanUniversitasAirlangga. Surabaya

Cholifah D, Mivida F, Arning WE, Yenny R. 2012. *Pengaruh Penggunaan Tepung Silase Daun Mengkudu (Morinda Citrifolia) Dalam Formula Pakan Terhadap Pertumbuhan Ikan Sidat (Anguilla bicolor) Stadia Elver.*Jurnal Kelautan. Vol. 5

Handajani H, Widanami, Setiawati M, Budiardi T, Sujono. 2018. *Evaluation of digestibility and ammonia excretion of fish meal and fish silage fed to juvenile Indonesian shortfin eel (Anguilla bicolor).* AACL Bioflux 11(2):495-504

Lovell T. 1989. *Nutrition and Feeding of Fish. An A VI Book.* Published by Van Nostrand Reinhold, New York.

Millamena OM, Relicado MC, Felicitis PP. 2002. Nutrition in Tropical Aquaculture. Southeast Asian Fisheries Development Center. Tigbauan, Iloilo, Philippines

Mulis. 2015. *Pembesaran Benih Ikan Sidat Dengan Jenis Pakan Yang Berbeda.* Jurnal Ilmiah Perikanan dan Kelautan. Vol. 3

Murtidjo BA. 2001. *Pedoman Meramu Pakan Ikan.* Penerbit Kanisius: Yogyakarta

National Research Council. 1993. Nutrien Requirement of Fish. National Academy Press. Washington D.C. 102 pp

Priatna AH. 2013. *hu Dan Pertumbuhan Benih Ikan Sidat Anguilla Marmorata Ukuran 1 Gram Pada Sistem Resirkulasi Dengan Padat Penebaran Berbeda.[Skripsi].* Bogor: Institut Pertanian Bogor.

Rukmana, Rahmat. 2003. *Budi daya dan Pasca Panen Lele Dumbo*. Agromedia. Jakarta.

Tyas, D.K.M. 2009. *Penggunaan Meat And Bone Meal (Mbm) Sebagai Sumber Protein Utama Dalam Pakan Untuk Pembesaran Ikan Nila (Oreochromis niloticus) [skripsi].* Bogor: Institut Pertanian Bogor

Widaksi CP, Limin S, Siti H. 2014. *Pengaruh Substitusi Tepung Ikan Dengan Tepung Daging Dan Tulang Terhadap Pertumbuhan Patin (Pangasius Sp.).* e-Jurnal Rekayasa dan Teknologi Budidaya Perairan Volume