Utilization Of Expired Sausage Meal As A Source Of Protein In Feed Formulations For Growth Of Tilapia Oreochromis Sp.

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ABSTRACT: It has been studied about utilization of expired sausage meal in tilapia (*Oreochromis sp.*) feed formulations with the aim to assess the level of the specific growth rate, feed conversion ratio and protein efficiency ratio. Five experimental feed contained 25% crude protein in feed which substituted with expired sausage meal as much as A (0%), B (10%), C (20%), D (30%), and E (40%). Test fish used tilapia (*Oreochromis sp.*) Weight (4.5 ± 1.26 gram) with a maintenance period of 30 days in a controlled aquarium. The results of this research were the best expired sausage meal dose that can deliver growth rate and feed efficiency was best to feed treatment A. This evidenced by the survival value of 90.00 ± 0.00, for specific growth rate of 1.29 ± 0, 09% weight / day, for a feed conversion ratio of 1.94 ± 0.01 and for protein efficiency ratio of 1.96 ± 0.01%.

Keywords: tilapia, expired sausage meal, growth and nutrient efficiency

1. Introduction

Aquaculture production in Indonesia has increased, where in 2013 the production of fish from aquaculture sector amounted to 9.67 million tons, while in 2014 the aquaculture sector produced 13.92 million tons of fish or an increase in production by 43%. Further that the increased production of tilapia farmed by 59% with a total harvest reached 1.1 million tonnes in 2014. Despite an increase in the cultivation, Indonesia still imports of feed or feed ingredients to meet the needs of fish feed in aquaculture sector (1) the increased production in the cultivation resulted in an increased in the amount of feed used. High feed prices led to declining profits obtained by farmers because the feed is a component of the highest production costs of around 35-70% of operating costs (2). One effort to meet the needs of feed for fish farming is to utilize the available food resources and tend not utilized. Research on some alternative raw material for fish feed originating from waste has been widely reported. As an example use of industrial waste processing tuna or TBM (Tuna By product Meal) can give tilapia growth by 74% (3). Meal fermented palm oil cake as much as 18% of the composition of the feed material used as a substitute for fish meal can increase the growth of carp (4). Expired sausages are sausages that were not fit for consumption or sausage which has undergone a longer shelf life limit. Expired sausages is one alternative to fish feed ingredients. Based on the analysis in the Laboratory of Food Safety, UB that expired with the kind of sausage beef sausage contains water, protein, carbohydrates, fat and ash respectively 61.35, 15.95, 8.41, 11.77 and 2.52 %. Based on the nutritional composition, it can be considered that deserve expired sausage used as a raw material tilapia (*Oreochromis sp.*) feed. It is also supported by the results of the study (2) (Webster and Lim 2002) that the need for protein in feed for tilapia was growing by 28%. The purpose of this study is to investigate the use of expired sausage meal in feed formulation on growth and feed efficiency of tilapia (*Oreochromis sp*.).

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2. Materials and Method

The research was conducted in January-July 2015. The implementation of the proximate test, conducted at the Laboratory of Engineer Fishery Products, Faculty of Fisheries and Marine Science, UB and tilapia fish feed biological testing conducted at the Laboratory of Nutrition, Faculty of Fisheries and Marine Science, UB.

Tilapia FishFeed

The tools used were measuring 50x30x15 cm3 aquarium as many as 15 pieces, blower, hose aeration, aeration stone, plastic hoses, feed printing machine, the pH meter (PHM-210), DO meter and analytical balance. Materials used were tilapia jatimbulan measuring 5-7 cm average weight of 4.5 ± 1.26 grams with a stocking density of 1 head / liter (5).

Analysis of WaterQuality

Measurements of pH, dissolved oxygen and temperature measurement was done 2 times daily at 06.00 and 02.00 pm for 30 days. Ammonia measurements performed on days 0, 10, 20 and 30 days.

Analysis of the Growth of Tilapia (*Oreochromis* sp.)

Analysis of growth was done every 10 days by counted weight of the test fish. The results of measuring Specific growth rate (SGR), feed conversion ratio (FCR) and protein efficiency ratio (PER).

Data Analysis

Data analysis was performed by analysis of variance ANOVA usied SPSS version 16.

3. Result and Discussion

Proteins and amino acids contained in feed is a very important factor for the growth of tilapia (Oreochromis sp.)

(6). Crude protein content in the diet of tilapia at least 28% (2). The proximate composition of expired sausage meal in feed formulations can be seen in Table 1.

	Basic material	Feed formulations				
		A (0)	B (10)	C (20)	D (30)	E (40)
	Fish meal*	21,98	19,79	17,59	15,39	13,19
	Expired sausage meal*	0,00	6,48	12,96	19,44	25,92
	Soy meal*	29,57	29,57	29,57	29,57	29,57
	Bran meal*	22,32	22,32	22,32	22,32	22,32
	Tapioka meal*	22,50	16,86	11,22	5,57	0,00
	Cr2o3	0,50	0,50	0,50	0,50	0,50
	Cmc	0,12	1,48	2,84	4,20	5,49
	Vitamin and mineral	3,00	3,00	3,00	3,00	3,00
	Total materials (gram)	100,00	100,00	100,00	100,00	100,00
	Nutrition composition oftest feed (%)					
	Protein (%)	25,06	25,04	25,03	25,01	25,00
	Fat (%)	8,73	9,90	11,06	12,22	13,38
	Ash (%)	9,62	9,77	9,91	10,06	10,21
	Crude fiber (%)	6,57	6,48	6,38	6,29	6,19
	BETN (%) **	46,40	43,84	41,28	38,71	36,22
	De (kkal/gram)***	3,70	3,70	3,70	3,70	3,70

Notes:

* :Result Analysis by Laboratory of Food Safety, Faculty of Agricultural technology, University of Brawijaya

* * : BETN = 100-Protein-Fat-Ash-Fiber

*** : Energy = (4 x % Protein) + (9 x % Fat) + (4 xBETN)

The Growth of Tilapia (*Oreochromis*sp.)

The water quality has an important role that can support life and growth of tilapia (*Oreochromis*sp.) So that the measurement of water quality is very important, in addition to the water quality has an impact on health which resulted in low growth rates of fish. Water quality during the maintenance period can be seen in Table 2. The pH, DO, temperature and ammonia showed an optimal value for the cultivation of tilapia (*Oreochromis*sp.). This showed that utilization of expired sausages meal in feed formulation did not give a negative influence on the quality of water for the maintenance of tilapia (*Oreochromis* sp.).

Tabel 2.*Water quality during maintenance*

Water Quality Parameter	Result	Normal	Literature
pH	7,7–8,1	5 – 9	(2)(Webster andLim, 2002)
Temperature (^{0}C)	28 – 29	25–30	(2)(Webster and Lim, 2002)
DO (ppm)	6,2–6,5	> 4,0	(7)(Nandlal and Pickering, 2004)
Ammonia (ppm)	0,01-0,15	< 0,6	(8)(Riche andGarling, 2003)

Survival of tilapia during maintenance showed values were not significantly different between treatments ($p < 0.05$). The average survival rate of all treatments produced in this study ranged from 84.21 to 90% and quite good on this maintenance. The high value of survival in this study indicated that utilization of expired sausages meal in feed formulation did not give a negative impact on the survival of tilapia (*Oreochromis*sp.). Another factor affected the survival rate was a factor water quality during maintenance (9). Growth rate and feed efficiency during maintenance can be seen in Table 3.

Tabel3.*Growth rate andfeed efficiencyduring maintenance*

Parameter	Treatments				
	A (0%)	B (10%)	C(20 %)	D (30%)	E (40%)
Survival (%)	84,21^a	90,00^a	90,00^a	84,21^a	84,21^a
SGR (% BB/hari)	1,29^b	1,58^a	1,34^b	1,32^b	1,02^c
FCR	1,94^b	1,60^a	1,87^b	1,88^b	2,52^c
PER	1,96^b	2,36^a	2,05^b	2,03^b	1,51^c

Notes: The same letters in the same column showed no significant difference in the level of confidence 95%.

Utilization of Expired sausages meal given a specific growth rate (SGR) on the growth of tilapia (*Oreochromis*sp.)($P > 0.05$). Specific growth rate in this study showed the best results in the substitution of feed 10% (A). Expired sausages meal nutritional composition can improved the quality of feed, because the growth of fish due to the amount of feed nutrients that can be digested and absorbed by fish larger than the amount of nutrients needed by the body for maintenance of body (10). Nutrients in feed would increase fish growth due to variations in amino acid derived from Expired sausages meal increased the growth of fish better than other treatments. According to (11) Hermann (2005) stated that protein acts as a source of nutrients for the repair of damaged tissue, maintenance of body protein, growth, formation of enzymes and hormones. Utilization of Expired sausages meal given a feed conversion ratio (FCR) on the growth of tilapia (*Oreochromis sp.*)($P > 0.05$). Feed

conversion ratio (FCR) indicated that feed can be utilized by fish. Utilization of Expired sausages meal as much as 10% provided the best feed conversion ratio than other treatments. This decreased due to the balance of sources of nutrients that can be absorbed by body for growth. Feed conversion ratio in the cultivation influenced by the quality and quantity of feed (12). Utilization of Expired sausages meal can provide protein efficiency (PER) on the growth of tilapia (*Oreochromis*sp.) (P> 0.05).Protein efficiency ratio (PER) of 10% best in treatment. The amount of protein efficiency ratio indicated that amount of protein that can be utilized by fish. Utilization of the protein affected by the amino acid requirement under on the growth of tilapia. According to (6) lane (2000) stated that quality of protein a feed material is determined by the content of amino acids contained therein especially essential amino acids.

4. Conclusion

Based the explanation, amount of expired sausage meal as much as 10% can provided the best growth and can replaced fish meal in feed formulations.

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