

# Effect of feeding silkworm on growth performance and feed efficiency of snakehead (*Channa striata*)

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**Abstract.** The snakehead, *Chana striata* is a carnivorous freshwater fish and widely distributed in Asia. High demand of this fish has been triggering many aquaculturist to culture *C. striata*. Feed was the important factor for fish growth. Silkworm has high protein content, low fat and can be used as natural feed for finfish. This study investigate the silkworm feed in *C. striata*. The treatment of this research were A (100 % pellet); B (100 % silkworm); C (combination of 75 % pellet and 25 % silkworm); D (combination of 50 % pellet and 50 % silkworm); and E (combination of 25 % pellet and 75 % silkworm). The variables measured in this study were relatif growth, specific growth rate, feed efficiency, feed conversion ratio, and survival rate. The result show that silkworm gave the high growth performance, feed efficiency and survival rate of the snakehead (*Channa striata*) compared with the control.

## 1. Introduction

The snakehead, *Channa striata* is a carnivorous freshwater fish, which distributed in Asia. It has high protein content, rich of albumin, and low lipid content [1]. For decades, the minimum nutrient requirement and lower cost of feed for normal fish growth is a focus of fish nutrition of aquaculture [2]. Feed for carnivorous fish is generally contain high protein. Protein from the feed is required for the fish to utilize amino acids either to build new proteins during growth and reproduction or to replace existing ones during maintenance [3].

Silkworm has nutritional content of crude protein 64.47 %, crude fat 17.63 %, crude fiber 0 %, ash 7.8 % and BETN 0.06 % [3]. Result of research by Kusumaningrum [4] showed that feed with protein content 32 % affect the highest growth rate of Snakehead about 0.269 g/day with 1.73 % albumin level. Furthermore, Amanta [5] study on the effect of feeding combination pellet and silk worms are 75 % and 25% improve the length and weight of catfish that 3.32 to 3.40 cm and 0.37 to 0.38 g for 40 days maintaining resulted in a final length growth of 3.51 cm and an absolute weight of 1.66 g. Considering the amount of benefits of albumin, especially for health and industry and the high nutritional value of snakehead. Formulated diets for the snakehead is not already exist especially in Indonesia.

Fish meal has been used in aquaculture and industrial as fish feed because of its high protein content. Due to the high price of the fish meal, its need to find other source as fish feed that has high nutritional content, lower of cost and easy to be produced. Silkworm has high nutritional content especially protein and can be cultured easily. Cost production of Silkworm is cheap in Indonesia



because the needed of its food can be from. This study wanted to evaluate the effect of feeding combination pellet and silkworm on the growth performance and feed efficiency of snakehead.

## 2. Experimental

### 2.1. Time, location and fish husbandry

This research was conducted from May to July 2017 at the Laboratory of Aquaculture, Departement of Aquaculture, Faculty of Agriculture, Muhammadiyah University of Gresik. A total of 450 snakehead in length about 5-7 cm were cultured in 30 L concrete tank. The fish density was 1 fish/L. Fish was feed following the treatments in three times a day at 08.00 a.m, 12.00 a.m and 05.00 p.m.

### 2.2. Experimental design

Experimental design was Completely Randomized Design (CRD). The treatments were A (100 % Pellet); B (100 % Silkworm); C (combination of 75 % Pellet and 25 % Silkworm); D (combination of 50 % Pellet and 50 % Silkworm); E (combination of 25 % Pellet and 75 % Silkworm); which was triple replicated.

### 2.3. Experimental variable

The snakehead was cultured for 28 days. Every 7 days, fish was wighed and analyzed. Water temperature and pH were recorded twice daily in the morning and evening. The variables measured in this research were relative growth (RG), specific growth rate (SGR), feed efficiency (FE), feed Conversion Ratio (FCR), and survival rate (SR).

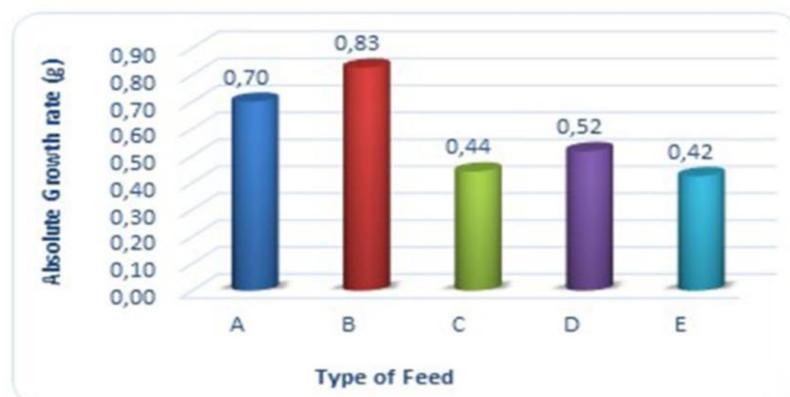
### 2.4. Data analyzed

Data were analyzed using one way analysis of variance (ANOVA). The difference between treatmens means to be significant at 95 % were analyzed with Duncan's Duncan's Multiple Range Test (DMRT). SPSS software were applied for the data analysis.

## 3. Result and Discussion

### 3.1. Absolute growth rate

Absolute growth rate of the snakehead in 28 days culture is shown in figure 1.

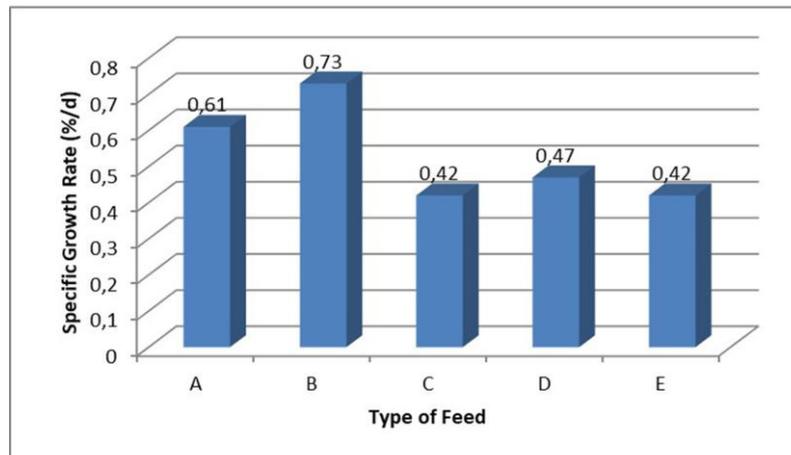


**Figure 1.** Absolute growth rate of the snakehead in 28 days culture.

The result shows that silkworm has higher of absolute growth rate 0.83 g ( $P < 0,05$ ). Its follows by treatment of A 0.70 g, D 0.52 g, C 0.44 g and E 0.42 g, respectively.

*3.2. Specific growth rate*

The specific growth rate of the snakehead in 28 days culture is shown in figure 2.

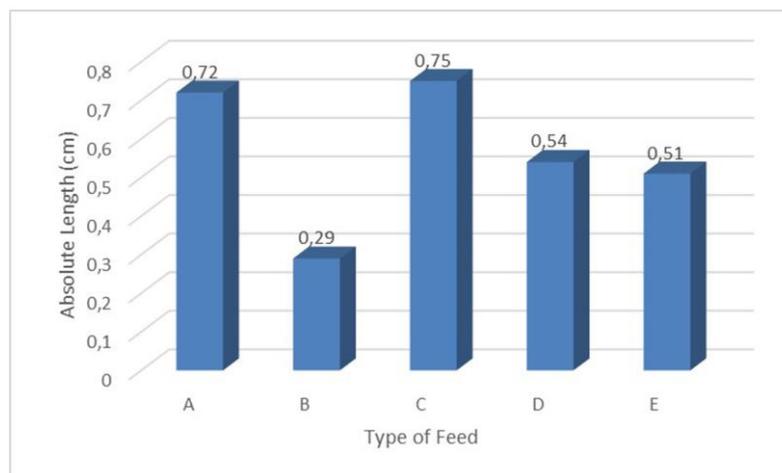


**Figure 2.** The specific growth rate of snakehead in 28 days culture.

The highest specific growth rate is snakehead that given feed 100% silkworm, and follows by another treatment same as the absolute growth rate.

*3.3. Absolute length rate*

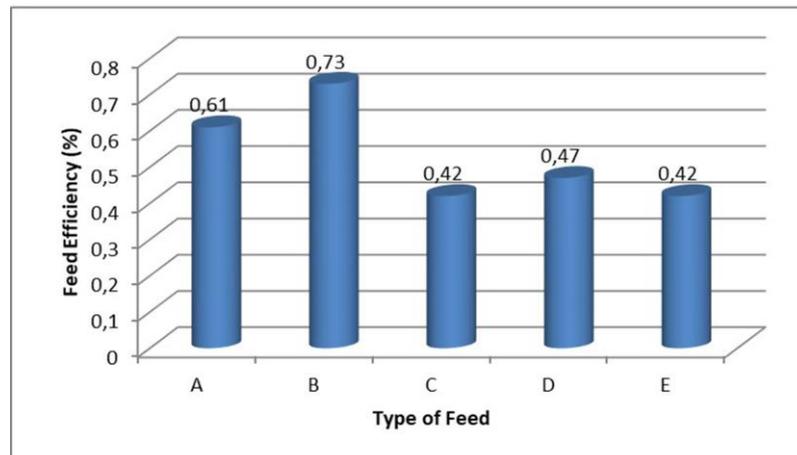
The highest absolute length rate shown in the treatment C, A, D and E that significantly different with the treatment B 100 % silkworm. The absolute length rate of snakehead feed by 100 % silkworm has the lowest length rate.



**Figure 3.** Absolute length rate of the snakehead in 28 days culture.

*3.4. Feed efficiency*

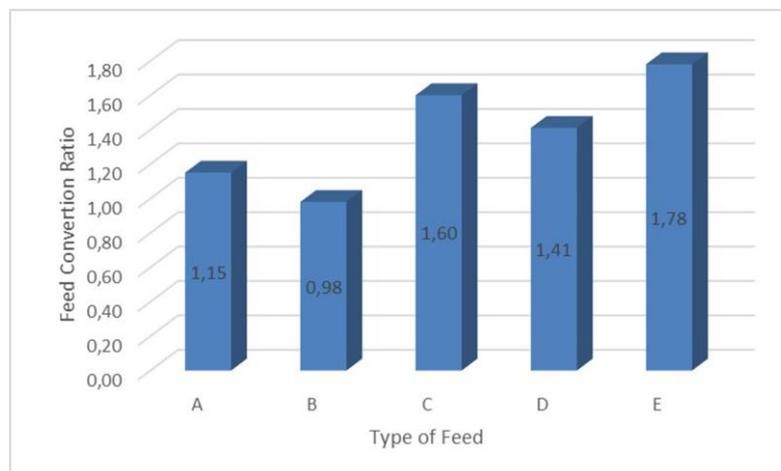
Figure 4 shows that the best feed efficiency of the treatment is the snakehead feeding by 100 % silkworm.



**Figure 4.** Feed efficiency of the snakehead in 28 days culture.

### 3.5. Feed conversion ratio

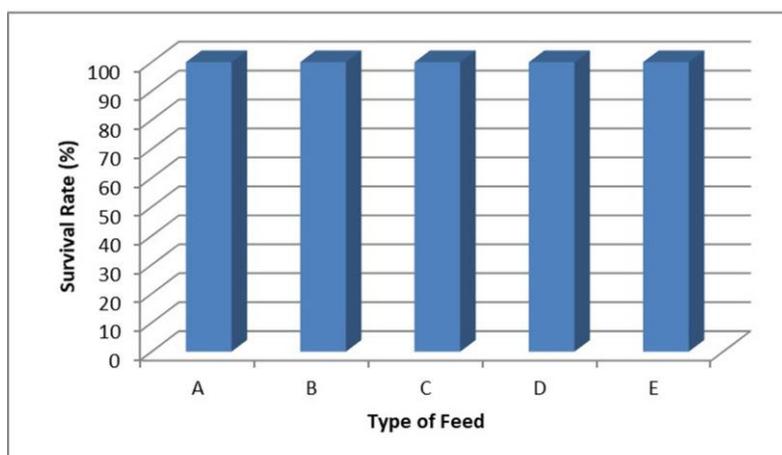
Feed conversion ratio was shown in figure 5. Feed conversion ratio of the snakehead feeding by 100 % silkworm is the best result (0.98), followed by other treatment that significantly different ( $P>0.05$ ), there were A (1.15), D (1.41), C (1.60) and E (1.78).



**Figure 5.** Feed conversion ratio (FCR) of the snakehead in 28 days culture.

### 3.6. Survival rate

The result in figure 6 showed that survival rate for all the treatment is 100 %. All fish from all treatments were survive until the end of treatment.



**Figure 6.** Survival rate of the snakehead in 28 days culture.

### 3.7. Water quality

Water temperature and pH of the snakehead culture in 28 days is shown in table 1. Water temperature of all treatments is in the normal range.

**Table 1.** The average of water temperature and pH of the snakehead culture.

Treatments	Time a day			
	Morning		Evening	
	Temp (°C)	pH	Temp (°C)	pH
A	28.9	9.06	26.7	8.17
B	29.1	8.81	26.7	8.53
C	27.7	8.82	26.1	8.28
D	27.1	8.86	26.7	8.48
E	27.9	8.82	26.8	8.31

## 4. Discussion

Growth involves several processes. It is highly influenced by the digestive rate and absorptive physiology of an organism, which affect the rudimentary dynamic of utilization of ingested nutrient and control the extent of a fish's response. The activity of digestive enzyme is influence by the composition of diet and ability of fish to digest and absorb diet effectively [6].

In this research, 41% dietary protein level in pellet produced low absolute wight, specific growth rate, and feed efficiency. Protein level of silkworm is about 60 %. Fish fed diet pellet or all the combination pellet and silkworm had the lower growth performance. It suggested that the combination failed to meet nutritional requirements of *C. striata* under the conditions of this research.

Juvenile snakehead in this research need higher protein content in the diet more than 41 %. However, this field of research seems largely unexplored the albumin level, digestive enzyme and the relationship between digestive enzyme activity and growth performance.

Silkworm (*Tubifex* sp.) is good for the growth of juvenile of snakehead [7]. Then, the silk worm emits a distinctive aroma that might attract the attention of cork fish to eat it. Silk worm contains

vitamin B12, calcium, pantothenic, nicotinic acid and vitamin B2. In addition, silk worms are easily digested by carnivorous fish because they do not contain crude fiber.

The growth rate is closely related to the composition of the material and nutrient content of the feed. Based on the results of statistical analysis, indicated that the absolute growth and the highest specific growth rate was found in corks fish fed 100 % silk worm (treatment B) which was significantly different from other treatments.

Snakehead fish in the B treatment is able to digest the feed better than other treatments. B well-digested feed will produce an energy supply. Energy derived from this feed is used to improve body structures. Excess energy is used for growth. Growth occurs when there is excess energy after energy used for body maintenance, basal metabolism, and activity [8,9].

## 5. Conclusion

Silkworm can be used as an alternative source of fish feed especially for juvenile snakehead because of high protein content. Snakehead which is fed by 100 % silkworm give the best growth performance, feed efficiency and survival rate significantly different from the other treatment.

## 6. References

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