Effect of Protein Level and Energy-Protein Ratio on the Broodstock Growth Performance of Senggaringan Fish (*Mystus Nigriceps*)

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ABSTRACT

This research was conducted to evaluate the effect of protein level and energy protein ratio on the growth performance broodstock of Senggaringan fish (*Mystus nigriceps*). Three experimental diets and five replications were used in this experiment. Diet A containing 25% protein with energy-protein ratio 18.0 kcal/g protein (25%;18.0), B containing 30% protein with energy-protein ratio13.9 kcal/g protein (30%;13.9), C containing 35% protein with energy-protein ratio 12.0 kcal/g protein (35%;12.0). Fish was fed on experimental diets two times a day at libitum for 35 days. Based on body weigth biomass of the fish, A treatment has a growth from 43.06g to 44.25g, treatment B growth from 43.31g to 46.36g and C treatment growth from 47.40g to 47.70 g. The result found that diets B produced the highest growth performance.

Key words: senggaringan, protein level, protein-energy ratio, growth

INTRODUCTION

Senggaringan fish (*Mystus nigriceps*) represents important and potential fishery source to be developed in Purbalingga Regency. The case was proven by utilization for consumption by the society because it has delicious taste. Demand of Senggaringan fish tends to increase, however until now, the supply still depends on natural catch. Therefore, domestication technology needs to be developed to support it was continues production.

Success of domestication was highly determined by several aspects, one of it was nutrition (Slamet *et al*., 1999; Laining and Rachmansyah, 2002; Suwirya *et al*., 2002). To date the information about nutrients demand for senggaringan fish in every level is not available. One of aspect nutrition approach that can be carried out was by estimating protein requirement and energy protein ratio. The fish can be grown when fish consume diet. The growth only happens when energy requirement for maintaining live processes and other functions are fulfilled.

Several important information that can support general waters management and cultivation are continuously collected and studied by researchers, such as ecology and reproduction (Sulistyo and Setijanto, 2002), reproduction biology (Rukayah *et al*., 2003), morphoanatomy index of female senggari ngan fish (Sulistyo *et al*., 2007), diet and feeding behavior (Setyanto, 2007) and initial study of life cycle (Pramono and Marnani, 2006). However, research information about nutrients requirement of main parent candidate protein and energy-protein ratio is still very limited. The information is very important in determining success effort of future feeding management.

Protein is important nutrients in fish ration for somatic or gonadic development (Hammer *et al*., 2006; Rodriquez- Gonzalez *et al*., 2006) or feed cost (Thompson *et al*., 2005; Lee *et al*., 2006). Protein represents the most abundance nutrient in fish body, therefore protein diet should be utilized as efficient as possible for fish growth. In order to utilize feed protein efficient, by the protein must be compensated by non protein energy, such as fats and carbohydrates that have role as sparing effect of the protein (Shiau and Huang, 1990; Perez and Teles, 1999). Majority of protein should be utilized as growth, not being converted into energy (NRC, 1993). Requirement of protein and energy-protein ratio in senggaringan fish need to be studied to obtain information of optimum demand, because the requirement was highly influenced by fish species, age, fish size, diet protein quality, feed digestibility and environment conditions. Knowledge about optimum protein demand is one step that can be conducted to guarantee the success of domestication effort of senggaringan fish.

MATERIALS AND METHODS

The research was conducted during 35 days located in Aquaculture Laboratory of Fishery and Marine Department, Science and Technique Faculty, Jenderal Soedirman University. Analysis of proximate was conducted in the Laboratory of Cattle Feed and Nutrition, Animal Husbandry Faculty, Unsoed.

Experimental Diet

Experimental diet used for growth observation was commercial diet that has different protein content and protein-energy ratio. Diet protein content comprised of three protein level namely, A (25%; 18), B (30%; 13.9) and C (35%; 12). Diet was made in pellet form. Composition of experimental diet was illustrated in Table 1. The gross energy of pellet diet was measured in Animal Physiology Laboratory of Biology Faculty Unsoed and proximate analysis was conducted in Laboratory of Cattle Nutrition and Feed, Animal Husbandry Faculty, Unsoed.

Table 1. Composition of experimental diet with different protein and protein-energy ratio (g/100g diet).

Ingredient	Diet (% protein; protein-energy ratio)		
	A (25;18)	B (30;13.9)	C (35;12)
Fish Meal	18.37	22.04	25.72
Soy Meal	13.08	20.28	31.35
Pollard	43.80	38.93	28.04
Wheat Flour	7.00	9.00	5.00
Tapioc meal	3.00	3.00	3.00
Fish Oil	7.37	1.23	1.37
Soy oil	1.86	0.00	0.00
BHT	0.01	0.01	0.01
Mineral Mix	3.00	3.00	3.00
Vit. Mix	1.50	1.50	1.50
Vit. C	0.01	0.01	0.01
C. Clorida	0.50	0.50	0.50
Atractan	0.50	0.50	0.50

Note: protein content (dry weight): fish meal 68.05%, soybean residue meal 41.01%, pollard 14.23%, wheat flour 12.45% and tapioca meal 0.91%.

Fish Rearing and Data Collection

Experimental fish is senggaringan fish obtained from Klawing River with assistance of fishermans. Before feeding with experimental diet, fish was adapted for 20 days in rearing container, with the size of measure 60 x 40 x 40 cm. The research was carried out in three treatments and five replications. During rearing period, 50% water was replaced every morning before fish fed. Experimental diet was conducted for 35 days.

Water quality parameters observed were dissolved oxygen (titimetry method) pH and water temperature. Observation on oxygen was conducted in initial and at the end of research while pH and water temperature was conducted once a week during sampling of biomass weight. Biomass weigh was measured once a week during rearing to observe weight and length of fish. Feed was given ad libitum two times per day at 08.00 and 15.00 hours.

Proximate Analysis

Proximate analysis comprised of crude protein, crude fat, ash, crude fiber, nitrogen-free extract and water content of each material such as; fish meat and experimental diet. Proximate analysis of ingredients and experimental diet was conducted at the beginning of research while analysis of fish body was conducted at the beginning and the end of study. Samples of experimental diet and experimental fish meat were chemically analyzed based on standard procedure (Takeuchi, 1988). Crude protein was analyzed by Jeldahl method, crude fat with extraction method by Sochlet equipment. Ash by sample heating in tenure at temperature of 600°C, crude fiber with sample destruction in boiling acid and strong base and water content by heating method in oven at temperature of 105°C. Measured parameter was increase of biomass weight which is discussed descriptively.

RESULTS AND DISCUSSION

Experimental Diet

Experimental diet produced has certain protein level and different energy ratio, analysis result of chemical composition presented in Table 2. Result of proximate analysis showed that diet material used for experimental diet production was meet requirement, so that obtain result that according with Table 1. This caused by in experimental diet formulation, each raw material selected understood it nutrition value. Nutrient content of each diet material understood from laboratory assessment so that commercial diet formulated contains nutrient as expected.

Result of feeding study with different energy and protein content in diet was can influence growth of senggaringan fish. Change of fish biomass was presenting in Figure 1. Based on Figure 1, each treatment increased fish biomass. Average fish biomass was increased at the end of rearing that was A = 44.25g, B = 46.36 g, C = 47.7 g. Growth was indicated by change of length size, weight and volume. Growth of fish was closely related with protein availability in the diet. This can be understood by considering that almost 65-75% of fish flesh dry weight comprise of protein (Watanabe, 1988). Protein represents nutrient that is highly required by fish for growth. Number and quality of protein would influence fish growth (Harper, 1988).

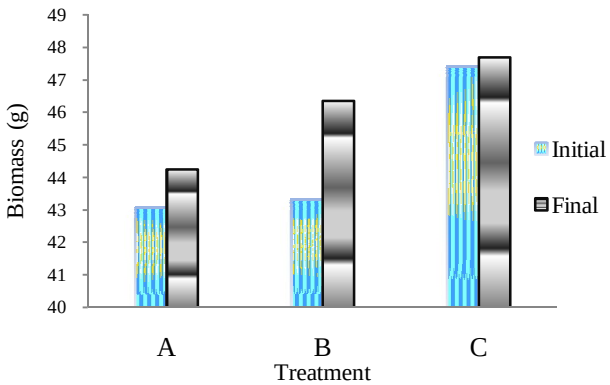

Figure 1. Change of Fish Biomass Influenced by Protein and Energy Level

The increase of fish biomass was limited by level of protein content and protein energy ratio (or total energy) of diet. After 35 days treatment it showed that there was biomass change in each treatment (Figure 1). This was caused by energy content in diet consumed by fish was higher than demand for maintenance energy, including for respiration, metabolite transportation, body temperature regulation and other physical activities as stated by Lovell (1988). It means that energy requirement for maintenance should meet first and the remaining will be used for growth. This proves that usage protein number of diet by fish in treatment was different, because there was difference between protein in diet and non protein energy of diet in each treatment.

From growth data of fish biomass showed that diet B yielded highest growth than diet A and C. Diet B comprised of protein 30%, while diet A 25% and C 35% while fat content relatively same and carbohydrate level of diet B higher than diet C, means that protein ratio of B diet higher than diet C (Table 2).

Table 2. Result of experimental diet proximate analysis (% dry weight)

Nutrient	Proximate result (%DM)		
	A (25;18)	B (30;13.9)	C (35;12)
Crude Protein	24.98	30.25	35.46
Crude Fat	10.3	2.08	2.12
Ash	8.52	9.2	10.68
Fiber	8.77	6.7	5.4
NFE	47.8	51.6	46.29
Total Energy (KJ/g)*	430.97	400.512	417.69

Note: NFE = Nitrogen-Free Extract.

Generally, this study showed that senggaringan fish also require non protein energy, either from fat or carbohydrate from diet. Actually senggaringan fish is able to utilize carbohydrate as energy source, although-protein level of diet B lower than C. However diet B can store diet protein into body protein the same as diet C. This means that the majority energy for fish activities is expected comes from non protein nutrient (fat and carbohydrate). When energy contribution from non protein was low then protein will be degraded as used for energy, so that protein deposition as body tissue is decreased.

Balance of energy and protein in diet was highly responsible to support fish growth. Treatment A has protein content of 25% with energy compensation in diet (430.97kcal GE/g) could not fulfill protein requirement for senggaringan fish. Low protein retention that occurred in protein level of 25% means that protein provided was still low for fish growth, although it was provided high total energy.

According to NRC (1993), the optimum energy level in diet is very important because energy shortage will result in decrease of growth rate. Further more, Chow and Watanabe (1988) also stated that young animals generally need higher energy per bodyweight unit for maintenance function than adult animals, although reproduction process increased energy demand of adult animals.

Fish survival during study was relative by the same between treatments. For dissolved oxygen content in each treatment ranged from 8-9 ppm, temperature ranged from 21-25C and pH level ranged from 6-7. This indicated that amount or type of diet provided already enough to meet maintenance requirement of fish and even provide growth for fish.