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Determination optimal protein and lipid content of feed for farmed catfish *Pangasius sutchi*

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Abstract

A major challenge in commercial catfish farming is to feed the fish to achieve optimal growth with minimal waste. Protein and lipids play a major role in a fish feed as fish gathers energy through these high cost ingredients. Identification of the optimal protein and lipid combination is important to build up profitable aquaculture industry. The effect of different protein and lipid levels for growth of farmed catfish, *Pangasius sutchi* fry were studied for six experimental diets using a 3 × 2 factorial design with triplicates. Groups of 12 fish per tank, with initial mean weights of 1.07 ± 0.18 g were fed with six test diets comprising combination of three crude protein levels (25%, 30%, 35%) and two lipid levels (6%, 10%). Feeds were incorporated with an inert marker (Chromic oxide) to measure digestibility. The fish were fed until satiety twice a day for 7 weeks. Feed Conversion Ratio (FCR), Specific Growth Rate (SGR) Condition Factor (K) and digestibility were calculated. FCR and SGR were significantly different among the test diets. Generally, growth performances improved with the increasing protein level. The highest SGR and lowest FCR was recorded for the diet containing 35% protein and 10% lipid and it was not significantly different ($p > 0.05$) from the diet that contained protein 35% and lipid 6%. The lowest SGR and highest FCR were recorded for the diet containing 25% protein and 10% lipid. The digestibility was not significantly different among the test diets. The results indicate that the use of feed containing 35% protein and 6% lipid diet is optimal for the growth performance of *Pangasius sutchi*.

Keywords: Digestibility, Feed conversion ratio, Specific growth rate, Marker

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Introduction

Thailand catfish *Pangasius sutchi* is most commonly used as an ornamental fish in Sri Lanka. Catfish were imported to Sri Lanka as they were difficult to breed successfully in Sri Lanka under the natural environmental conditions. However, recent studies have found that Thailand catfish can be bred artificially in Sri Lanka. There is a considerable potential to enhance the local market as well as providing catfish for international markets. Feeding is the most costly part of aquaculture. The main challenge in commercial catfish farming is to feed the fish to achieve optimal growth with minimal

waste. Protein and lipids are major components of fish feed as fish gathers energy through these macro nutrients and these are also the most expensive ingredients. Therefore, identification of the optimal protein and lipid combination is important to build up profitable aquaculture industry.

Materials and Methods

Study was conducted in 3×2 design with triplicates. Experimental diets were formulated using trial and error method to contain three dietary protein levels (25%, 30%, and 35%) and two lipid levels (6%, 10%). Triple Nine fishmeal (64% protein) and soya bean meal (48.48% protein) were used as protein sources and sun flower oil combine with fishmeal (10.01% fat) were used as lipid sources. Wheat flour was used as the carbohydrate source of the feed. Vitamin premix mineral premix Carboxy Methyl Cellulose and Chromic oxide (marker) were added in equal amounts.

Fish belonging to the same batch were selected and 12 fish per tank was stocked, with initial mean weights of 1.07 ± 0.18 g. Fish were fed twice a day, at 8 am and 2 pm till satiation for seven weeks and the amount of feed used was measured. Water quality parameters were monitored and maintained at acceptable levels. Growth measurements (wet body weight and standard length) were taken once a week. Fecal matter was collected and analyzed for the marker concentration to determine digestibility.

Results and discussion

No mortality was recorded during the experimental period. Table 1 summarizes the growth performances during the experimental period. All statistical analyses were done using SPSS version 17.

Generally the final body weight, final body length and SGR of fish improved significantly ($p < 0.05$) and FCR decreased significantly with increasing protein level. Similar findings were reported by Ngan (1999), and Salhi *et al* (2004). However, there was no significant difference in SGR between fish fed with 35% protein and 6% lipid, and 35% protein and 10% lipid diets. The lowest significant growth (SGR) was observed in diet of 25% protein and 10% lipid, which was similar with Pothmasonthy and Lim (1987) who concluded that *Pangasius sutchi* fed with 24% protein diet in pond had inferior growth than those fed with 32% protein feed.

Increasing lipid content from 6% to 10% results in reduced SGR and increased FCR except at the highest protein level, 35%. The lowest SGR and highest FCR were

Table 1: Growth parameters of *Pangasius sutchi* fry fed with experimental diets

Dietary Protein	Dietary Lipid	FBW	FBL	SGR	FCR	K
25(%)	6(%)	4.14 ± 1.34ac	6.5 ± 0.6a	2.93 ± 0.49a	1.20 ± 0.10a	1.43 ± 0.08a
	10(%)	3.45 ± 0.80ac	6.2 ± 0.4a	2.43 ± 0.33b	1.44 ± 0.15b	1.41 ± 0.07a
Dietary Protein	Dietary Lipid	FBW	FBL	SGR	FCR	K
30(%)	6(%)	4.88 ± 1.47ab	6.8 ± 0.5ab	2.92 ± 0.62a	0.96 ± 0.04c	1.47 ± 0.11a
	10(%)	4.69 ± 0.76ab	6.8 ± 0.3ab	2.89 ± 0.41a	0.98 ± 0.03ac	1.47 ± 0.09a
35(%)	6(%)	5.89 ± 1.31b	7.3 ± 0.5bc	3.31 ± 0.33c	0.80 ± 0.03c	1.49 ± 0.16a
	10(%)	5.54 ± 1.28b	7.1 ± 0.5bc	3.51 ± 0.45c	0.84 ± 0.02c	1.50 ± .16a
Dietary Protein	Dietary Lipid	FBW	FBL	SGR	FCR	K
Protein %						
25		3.79 ± 1.07a	6.3 ± 0.5a	2.68 ± 0.48a	1.32 ± 0.12a	1.42 ± 0.07a
30		4.78 ± 1.11b	6.8 ± 0.4b	2.90 ± 0.52b	0.97 ± 0.21b	1.47 ± 0.50a
35		5.71 ± 1.29c	7.2 ± 0.5c	3.41 ± 0.40c	0.82 ± 0.31b	1.49 ± 0.14a
Lipid %						
6		4.97 ± 1.37a	6.9 ± 0.5a	3.05 ± 0.48a	0.98 ± 0.28a	1.46 ± 0.12a
10		4.56 ± 0.94a	6.7 ± 0.4a	2.94 ± 0.39a	1.08 ± 0.15b	1.46 ± 0.36a

FBW- final body weight (g), FBL- final body length (cm), K- condition factor, values with different superscripts showing the significantly different values ($p < 0.05$).

observed when fed with 25 % protein and 10 % lipid diet and it was significant. Phumee *et al* (2009) also found that the growth decreased when lipid content was increased from 6% to 10% when the protein content was 25%. The condition factor was not significantly different among any of the test diets. Therefore, fish fed with all diets are accounted as healthy and equal condition (Yalcin *et al.*, 2002). Digestibility (Figure 1) ranging from 94.5 - 95.1% did not differ among treatments.

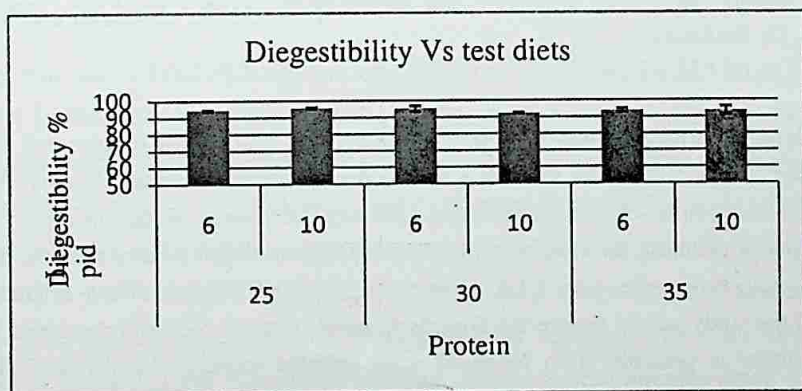


Figure.1 Digestibility of test diets as a percentage (All the values are mean \pm SD)

Conclusion

In the culture-based conditions the optimal diet combination for *Pangasius sutchi* larvae is protein 35% lipid 6% diet.

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