The Protein Requirement of Pla Swai Fry, *Pangastus sutchi* Fowler

Wiang Chuapoehuk and Thamrongsilpa Pothisoong[1]

ABSTRACT

Seven experimental diets containing 20, 25, 30, 35, 40, 45, and 50% protein were fed to pla sawai fry in twenty-one 350-liter circular concrete tanks for 60 days. Each dietary treatment was randomly assigned to three tanks which were stocked with 100 fish. Fish were fed seven days a week at the rate of 10% of fish body weight, and their dairy feed allowances were increased weekly on the basis of fish weight gain. Growth for each diet was compared along with survival rates and feed conversion ratios. Statistical analyses indicated that of the diets tested, a diet containing 25% protein produced optimum growth.

INTRODUCTION

It has been established that protein is required by all animals for body maintenance and growth, and that the protein level needed for these functions varies with the species and the culture environment (Munson *et al.*, 1954; Phillips *et al.*, 1957; Delong, Halver and Mertz, 1958; Lovell, 1972). For fish, the optimum amount of protein in concentrated feeds is important because either low or high lever of protein may lead the fish to poor growth and more susceptibility to diseases and parasites. Additionally, excess of protein in fish diets may be wasteful and cause the diets to be unnecessarily expensive.

The dietary protein level needed by catfish for optimum growth has been demonstrated in recent years by many investigators. Thus far, the majority of the work conducted on the protein requirement of catfish has been done with American catfish (Nail and Shell, 1962; Hastings, 1969; Hastings and Dupree, 1969). There has been virtually no such nutritional work on Thai catfish reported in the literature.

This study was, therefore, designed to provide information on the level of dietary protein needed by pla sawai fry for optimum growth in a laboratory-type culture where natural food is limited. Specific objectives were to determine growth and survival rates as well as feed conversion ratios for the fish grown from fry to fingerlings with nutritionally complete diets containing varying levels of protein.

MATERIALS AND METHODS

Twenty-one circular concrete tanks, each measured 100 cm in diameter and 75 cm in height, at the Department of Aquaculture hatchery house, Kasetsart University, Bangkhen, Bangkok were used in this experiment. The twenty-one tanks were each filled with 350 liters of tap-water which was held in 2-meter-high storages for at least one night before used. On September 3, 1979 these tanks

1 Department of Aquaculture, Faculty of Fisheries, Kasetsart University.

Table 1 Ingredients of seven feed rations fed to pla sawai fly in experimental, circular, concrete tanks.

Ingredient	Proportions used in different rations, percent by weight						
	20% protein	25% protein	30% protein	35% protein	40% protein	45% protein	50% protein
Fish meal	17	21	25	28	33	38	41
Soybean meal	23	28	34	41	45	50	56
Broken rice	52	44	35	26	18	9	1
Animal fat	6	5	4	3	2	1	–
Dicalcium phosphate	1	1	1	1	1	1	1
Salt	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Vitamin premix[1]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Trace mineral premix[2]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Antibiotic[3]	0.05	0.05	0.05	0.05	0.05	0.05	0.05

1 Contains vitamin A, C and D_3 in the amounts equivalent to those recommended by the National Research Council (1976) for a complete ration for warmwater fishes.

2 Includes $CaCO_3$, $MnSO_4 7H_2O$, $ZnSO_4$, $7H_2O$, $CuSO_4 5H_2O$ and $FeSO_4$ $7H_2O$. Their proportions used are as the same as those recommended by the National Research Council (1976) for a practical diet for warmwater fishes.

3 Oxytetracycline.

were each stocked with 100 readily-accepted diet pla sawai fry averaging 0.2 g in body weight, and the tanks were randomly arranged into seven feeding treatmants of which each replicated three times.

Seven nutritionally complete diets containing 20, 25, 30, 35, 40, 45 or 50% protein were assigned for the experiment. To minimize change in protein quality as protein level varied, a nearly constant ratio of one part of animal protein to three parts of plant protein was maintained for all seven of the diets. The ingredient composition of tne experimental diets was given in Table 1. The diets were processed as paste-form, sinking feeds by the same procedure as described by Chuapoehuk and Pothisoong (1978).

The fish were fed their assigned diets twice daily (9.00 A.M. and 3.00 P.M.) seven days a week at the rate of 10% of fish body weight throughout the experimental period. Every week a minimum of 40 fish were dipped by a net from each tank and weighed, and their average weight gains were determined. Daily feed allowances were adjusted weekly, based on the average weights of fish in each treatment.

After weighing the fish, each of the tanks was clean to prevent the accumulation of fecal materials and to reduce algal growth to a minimum. The same source and amount of water were then maintained for all of the tanks before the weighed fish were returned to their respective tanks.

On November 2, 1979 a total weight and a total count of the fish in each tank were measured to determine a final weight gain and a survival rate. A feed conversion for each tank was calculated as the ratio between the amount of feed given and the amount of weight gained. An average weight gain, survival rate, and feed conversion ratio for each of the treatments were estimated and statistically compared.

RESULTS AND DISCUSSION

Average weight gains, feed conversion ratios and survival rates of fish fed the experimental diets containing various protein levels are presented in Table 2. Growth was excellent for the fish received the diets containing 25, 30 and 35% protein. The lowest protein diet, containing 20% protein, and the diet containing 40% protein provided similar rates of gain; these were significantly greater than that of the 45% protein. The highest protein diet, containing 50% protein, produced significantly less growth than any of the other experimental diets.

Feed conversion ratios were lowest for the 30 and 35% protein diets. These conversion ratios were not significantly less than those of the diets containing 20, 25 and 40% protein but statistically lower than that of the 45% protein diet. The 50% protein diet was significantly less efficiently converted into weight gain than any diets in the other treatments.

Survival rate for the 25% protein diet was slightly, not statistically higher than those of the 20, 30, 35 and 40% protein diets, but was significantly greater than those of the diets containing 45 and 50% protein. The differences in

Table 2 Average weight gain, feed conversion, and survival rate for pla sawai fry fed diets containing various protein levels for 60 days in circular concrete tanks.

Diet (% protein)	Tank	Average weight gain per fish[1] (g)	Feed conversion[1]	Survival rate[1]
	12	2.540	1.46	99.0
20	16	2.680	1.49	82.0
	19	2.640	1.40	99.0
	Average	2.620[a]	1.45[a]	93.3[a]
	5	3.050	1.40	99.0
25	20	2.500	1.42	100.0
	23	2.830	1.30	100.0
	Average	2.793[b]	1.37[a]	99.7[a]
	4	3.000	1.27	100.0
30	13	2.650	1.34	93.0
	14	2.900	1.30	98.0
	Average	2.850[b]	1.30[a]	97.0[a]
	2	2.830	1.30	100.0
35	8	3.300	1.25	98.0
	17	2.500	1.36	100.0
	Average	2.877[b]	1.30[a]	99.3[a]
	6	2.800	1.39	98.0
40	10	2.600	1.48	98.0
	18	2.550	1.48	99.0
	Average	2.650[a]	1.45[a]	98.3[a]
	3	2.300	1.75	89.0
45	21	2.450	1.86	76.0
	22	2.480	1.88	70.0
	Average	2.410[c]	1.83[b]	7.83[b]
	7	2.000	2.28	68.0
50	9	2.300	2.00	75.0
	15	2.050	2.15	75.0
	Average	2.117[d]	2.14[c]	72.7[b]

1 Averages with common superscripts are not different at the 0.05 probability level.

percentages of survival among the 45 and 50% protein diets were not large, with the 50% protein diet gave poorest survival value.

The weight gain data indicated that under the feeding regime followed in this study there was no significant growth advantage in increasing the dietary protein level above 25%. Survival value was highest for the 25% protein diet. Feed conversion was nearly as efficient at the 2% protein level as at the three higher protein levels.

CONCLUSIONS

Based on the data collected in this stndy and with regard to the confines of the conditions under which this study was made, it can be concluded that, of the levels of protein tested, a minimum level of 25% protein is needed in the diet for optimum growth of pla sawai fry in laboratory or artificial - type cultures. If feeding is applied in natural -culture environments, lower levels of protein in the diet may possibly be justified.

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