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DIGESTIBILITY OF LIPIDS, CARBOHYDRATES, PROTEIN AND ASH IN FORMULATED DIET BY JUVENILES OF *OREOCHROMIS MOSSAMBICUS*

M. Shoaib[1*], K. Jamil[2] and F. Ameer[2]

[1]*Department of Zoology, University of Karachi,Karachi-75270, Pakistan*
[2]*Pakistan Council of Scientific and Industrial Research(PCSIR), Laboratories Complex, Karachi, Pakistan*

ABSTRACT

The digestibility of locally available ingredients namely fish meal, rice protein, squid, shrimps, fish oil, minerals, vitamins and salt by juveniles of *Oreochromis mossambicus* was evaluated for period of seventy five days. The juveniles were fed with formulated diet twice a day at average body weight and their excreta was siphoned out fort nightly. The proximate analyses of feed and fecal matter were carried out just after the collection of samples. The result indicated that digestibility coefficient of lipids was highest (80.56%) followed by carbohydrates (76.71%), protein (67.23%) and ash (43.76%).

Key words Formulated diet; Nutrient digestibility; *Oreochromis mossambicus*

INTRODUCTION

Many culturing techniques have been developed to obtain more value added products in tilapia culture due to highly resistant behaviour against poor water quality, scarcity of food and ability to feed low cost formulated diet (Schroeder and Hepher, 1979).In order to make feed, economically viable and to provide a reasonable nutritive composition of the diets, a knowledge of the digestible energy to protein ratio and balance amino acids of the diets are needed. The digestibility of nutrients present in diets may determine either by direct or indirect methods. The direct method involves measuring directly all of the nutrients consumed and all excreted in the feces (Slinger and Bayley,1982).The indirect method involves measurement of the ratios of nutrient to some indigestible components (indictor) in the feed and in the feces (Smith and Lovell,1973).There are reports on digestibility related to warm water fishes(Henken *et al* 1985, Spyridakis *et al* 1989, Windell *et al.* ,1978, Hari and Kurup 2001). The present study was aimed to investigate nutrient digestibility of locally available, low cost feed ingredients.

MATERIALS AND METHODS

1. EXERMENTAL DESIGN

Low cost feed ingredients (Table 1) shrimps squids, fish meal, fish oil, boiled rice, minerals, vitamin and salt were obtained from local market of Karachi, Pakistan. All the ingredients were mixed well in dry form. Warm water was added to mixture and thoroughly homogenized until the texture of the whole mass a stiff dough consistency. The dough was extruded through a hand pelletizier using 2 mm die. The resulted pellets were steamed for 10 min and in a hot air oven at 60 ^{0}C for 12 h. The dry pellets were broken into pieces of 1-3mm size and were stored in an air tight plastic bottle.

2. PROXIMATE COMPOSITION OF EXPERIMENTAL DIET

Moisture and crude protein were determined as described by AOAC (1990). Crude fat was estimated by Soxhlet extraction with petroleum ether (BP 60-80 ^{0}C) and ash content was determined from the residue remaining after incineration of sample at 550°C in a muffle furnace. Carbohydrate was computed by difference (Crompton and Harris). The physiological energy was calculated on the basis of 9 Kcal/g for fat, 4 Kcal/g for protein and 4Kcal/gm for carbohydrate (Maynard *et al.*, 1979).

*Corresponding auther: Department of Zoology,Unuversity of Karachi,Pakistan; E-mail: mushoaibku@hotmail.com

Table 1. Formulation and proximate composition of the experimental diet.

S. No.	Ingredients	Amount per kg.
1.	Fish meal	200 g.
2.	Rice protein	530 g.
3.	Boiled rice	100 g.
4.	Squid	20 g.
5.	Shrimp	100 g.
6.	Salts	0.25 g.
7.	Minerals	0.05 g.
8.	Vitamins	10 g.
9.	Fish oil	40 ml.
S.No.	Proximate composition	Amount in %
1.	Moisture	11.34%
2.	Fats	2.65%
3.	Ash	10.67%
4.	Protein	47.0%
5.	Carbohydrate	28.34%
6.	Energy	325 K.cal/100 g.

Table 2. Physico-chemical parameters of water treated with experimental diet.

Parameters	Days						
	0	15	30	45	60	75	Mean±SD
pH	7	6	6	6.33	7	7	6.55±0.502
Temperature(°C)	28.1	27.7	27.3	27.0	26.3	26.0	27.067±0.807
DO(mg/l)	4.5	4.2	4.4	4.6	4.8	4.8	4.55±0.2345
Ammonia(mg/l)	0.0	0.7	0.53	0.53	0.6	0.6	0.493±0.250
Nitrite(mg/l)	0.0	3.3	3.0	2.0	2.0	3.0	2.217±1.217
Nitrate(mg/l)	0.0	20	10	10	23.33	36.7	16.67±12.83
Chloride(mg/l)	5.49	10.32	28.97	10.04	11.57	12.40	13.13±8.12
Salinity(‰)	1.2	2.1	2.0	2.1	2.4	2.5	2.050±0.459
TDS(mg/l)	260	480	490	496.66	536.55	560	470.5±107.6

Table 3. Composition of nutrient intake and feeces with their % Digestibility.

	Protein (%)	Lipids (%)	Carbohydrate (%)	Ash (%)
Nutrient Intake	47	2.65	28.34	10.67
Nutrient in Feeces	15.4	0.515	6.60	6
% Digestibility	67.23	8.56	76.7	43.76

3. DETERMINATION OF PERCENT DIGESTIBILITY

The measurement of percent digestibility was carried out by direct calculation of nutrients as described by Slinger and Bayley (1982).The initial and final weights of live juveniles were determined to the nearest 0.01 mg by

weighing the individual fry in each aquarium after removing water with tissue paper. The %-digestibility of specimens was determined by using following formula (Sing, 1991).

$$\text{Percent digestibility (\%D)} = \frac{\text{Nutrient intake-Nutrient in feces}}{\text{Nutrient intake}} \times 100$$

RESULTS

1. WATER QUALITY

The physico-chemical parameters(Table 2) including temperature, pH, dissolved oxygen, free ammonia, nitrate nitrogen, nitrite nitrogen,chloride,salinity,total dissolved solids(TDS) were 27.0 ± 0.80,6.5 ± 0.50,4.55 ± 0.23,0.49 ± 0.25, 16.67 ± 12.83,2.21 ± 1.21,13.13 ± 8.12,2.05 ± 0.45,470 ± 107.6 respectively. All these parameters differ greatly to the water of extensive culture system.

2. DIGESTIBILITY OF FORMULATED DIET

The ingredients and proximate composition of nutrients in the formulated diet is presented in Table 3 containing 47% protein, 28.34% carbohydrate, 2.65% fats, 11.34% moisture, 10.67% ash and 325 Kcal/100g energy. Nutrient digestibility (%D) by the experimental juveniles of *Oreochromis mossambicus* was calculated as protein 67.23%, lipids 80.56%, 76.71% carbohydrate and ash 43.76%.

DISCUSSION

Studies involving various fish species have clearly shown the use of animal and plant based protein result in better growth due to its well balanced amino acid profile, perhaps coupled with unknown growth promoting factors (Andrews and Page,1974); Tacon and Jackson, 1985).The present results are a clear evidence for the varied degree of digestibility depending on the nature, source and composition of ingredients and their levels of inclusion. Although the decline in protein (67.23%) digestibility observed as compared to lipids (80.56%) carbohydrate digestibility (76.71%).

De Silva *et al.* (1990) reported reduction in protein digestibility with decreasing dietary protein content and increasing ash and fiber contents. Animal based protein diet is supposed to be better in fish production at 5% as suggested by Serena et al 1996.The present study indicates that it is advisable to test the ingredients according to the nutrient requirement of experimental fish. Digestibility of various nutrients is known to be influenced by different parameters like feeding level and meal size (Windell *et al* 1978) dietary components (Spyridakis *et al* 1989;DeSilva *et al* 1990) and type of nutrient (Nose and Toyama 1966).The present findings show that the digestibility is largely dependent on the nature and level of ingredients incorporated. The digestibility values obtained in the present study show that lipids and carbohydrates are suitable in the diet of juveniles of *O.mossambisus*.Further experiments are in progress to asses the effect of these ingredients on tissue chemistry and growth of Tilapias.

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