



Protein Conversion Efficiency (PCE) in Muscle of Freshwater Fish *Labeo rohita* fed on Formulated Feed

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ABSTRACT: Aquaculture is one of the fastest growing food producing sectors in the world accounting for approximately 50% of fisheries products. The protein component in aquaculture diet is the single most expensive portion and important dietary nutrient. Generally, feed ingredients of animal origin having higher protein content than the plant protein source. Protein conversion efficiency expresses the growth pattern of fish. Therefore, in the present study, experiment was conducted to evaluate Protein Conversion efficiency (PCE) of freshwater fish *Labeo rohita* fed on 100%, 75%, 50%, 25% non conventional formulated feed i.e. blood of bovine animals obtained from slaughter house and 100% conventional feed i.e. Groundnut oil Cake. During experiment, the fishes were fed at the rate of 2% of the total body weight per day. After experiment, the fish shows maximum values of PCE in formulated feed as compared to conventional feed.

Keywords: *Labeo rohita*, PCE, Formulated Feed, Groundnut oil Cake.

INTRODUCTION

Aquaculture is an intense expanding sector of agriculture and most rapidly growing markets for formulated feeds (Riaz 1997, Rosentrater 2009). Two major challenges for profitable fish feed production include feed formulation and processing (Kazamzadesh, 1989). Fish feed formulation plays a crucial role in production buyoncy, especially given the challenge manufacturing high quality protein, high lipid ratio with acceptable pellet durability and water stability (Rokey and Platner 2004). The largest cost component in aquaculture production is feed, which constitutes between 30 and 60 % of the total operational costs for an aquaculture farm. Protein is often the most expensive nutritional factor. Therefore, using low- price alternate sources of protein, which could provide better fish growth is beneficial for feed manufactures and aquaculture producers. (Davis and Stickney 1978; Lovell 1988, Keong, 2003, Rosentrater *et al.*, 2009). However increase in cost and demand of feed protein from conventional sources necessitates fish culturists of the developing countries to ingredients in fish feeds (Sithara and Kamalaveni 2008). Therefore, in the present experiment, the non conventional animal protein source such as blood of bovine animal is used in feed formulation as primary ingredient along with other ingredients which will enhance the growth and disease resistance in fishes.

In this study, the Protein conversion efficiency (PCE) was estimated on the basis of protein utilization of fish. Proteins are responsible for the cellular architecture and physiological activities of organisms. They are continuously synthesized from the dietary amino acids to build up new tissues or replace the tissue protein in the body of fish is considered as a measure its growth. Protein Conversion Efficiency (PCE) expresses the potentially of the fish to make use of its dietary proteins to increase its body protein. It will make to able find out growth pattern of fish. The endogenous and exogenous factors of fish influences on the protein conversion efficiency. In view of this, the present investigation has been designed to study the protein conversion efficiency of *Labeo rohita* fed on formulated and conventional feed.

MATERIALS AND METHODS

Formulation of feed: Blood of bovine animal (80gm) was taken. The other ingredients like milk powder (60 gm), corn flour (20 gm), and eggs (70 gm) were added and mixed well. Agar powder (4 gm) was added as binding agent; turmeric (0.5gm) and garlic (1 gm) as antibiotics. The said mixture was boiled, cooled at room temperature. After cooling cod liver oil (3.5 ml), vitamin mixture of vitamin B complex (1gm) and vitamin E (1 gm) were added. It was kept under refrigeration for 12 hrs. After 12 hrs it was squeezed over polythene sheet and dried at room temperature for 48 hrs.

The dried nodules were crushed into small pellets then sun dried to avoid fungal infection, weighted and stored in the bottle. Following the above procedure all the feeds were formulated in the percentage composition of 25% (blood 25% + groundnut oil cake 75%), 50% (blood 50% + groundnut oil cake 50%), 75% (blood 75% + groundnut oil cake 25%), 100% formulated (100% blood) and 100% conventional (100% groundnut oil cake).

Proximate analysis of feed: The feed were analyzed for moisture (Shaw, 1956), crude protein, crude lipid, crude fiber, and ash values. Crude protein ($N \times 6.25$) was determined after acid digestion by Kjeldhal method (Ma, et al., 1942), Lipid after extraction with petroleum ether in a Soxhlet apparatus, dry matter after drying at 100-105° for 24 hrs. and ash after combustion at 550° C for 12 hrs. Gross energy values was calculated assuming the energy values of protein and lipid (NRC, 1993).

I. Experimental design

After acclimatization, 25 fingerlings (5-6cm) of experimental fishes were randomly stocked in each aquarium for three months (90 days) in laboratory condition. This stocked experimental fishes were fed by conventional and non-conventional formulated feeds. The average initial weight (2-3 grams) of fingerlings was noted. During experiment, all physico-chemical parameters of experimental water (such as temperature, pH, alkalinity, hardness, dissolved oxygen, free carbon dioxide) were maintained within normal range. The fishes were fed at 2% of total body weight once a day. Determined total protein by Lowry's method (1951) after specific time interval of selected tissue such as muscle of experimental fish fed on formulated feed.

Similarly, the protein conversion efficiency determined at each selected time intervals of fishes by applying the related formula

II) Biological parameter analysis:

Protein Conversion Efficiency (PCE): The Protein Conversion efficiency of experimental fish was determined at 30, 45, 60, 75 and 90 days of specific time intervals. This parameter was estimated by using statistical formula as given below, (Murugain, et al., 2009).

Calculation:

Protein Conversion Efficiency (%): (Protein gained in muscle/ Protein consumed) $\times 100$.

Statistical analysis: Statistical analysis of data was performed by Analysis of Variance (ANOVA) using graph pad software.

RESULT AND DISCUSSION

In the present study, our main objective was to develop nutritionally balanced formulated feed for fingerlings of *Labeo rohita* based on the nutritive requirement of this species using alternate non- conventional animal protein source other than fish feed. From the present studies it is revealed that, conventional feed contains 33.94% of protein while the formulated feed has 43.27% of protein (Table 1). The experimental fishes fed on formulated feed noted highest total protein content (7.2 mg/100mg tissue) in muscle as compared to conventional feed (3.5mg/100mg tissue) (Table 2). The protein conversion efficiency of experimental fishes fed on formulated feed shows better result (11.36) as compared to conventional feed (5.15) respectively (Table 3). From this, it's clear that the formulated feeds well utilized in the body of fish.

Table 1: Proximate analysis of Conventional and Formulated feed.

Sr.No	Parameter	Conventional feed	Formulated feed			
			100%	75%	50%	25%
1	Moisture (%)	6.16	5.6289	8.011	6.784	6.789
2	Ash (%)	4.73	6.120	3.64	3.69	4.39
3	Protein (%)	33.94	31.84	43.27	29.89	30.29
4	Fat (%)	7.72	4.01	7.46	6.52	5.4
5	Fiber (%)	2.28	6.05	8.8	6.2	2.4
6	Carbohydrate	44.64	52.34	18.8	52.18	51.478
7	Energy kcal/100g	372.82	315.42	315.42	386.80	375.51

Table 2: Total protein content of Muscle of freshwater fish *Labeo rohita* fed on Conventional and Formulated feed.

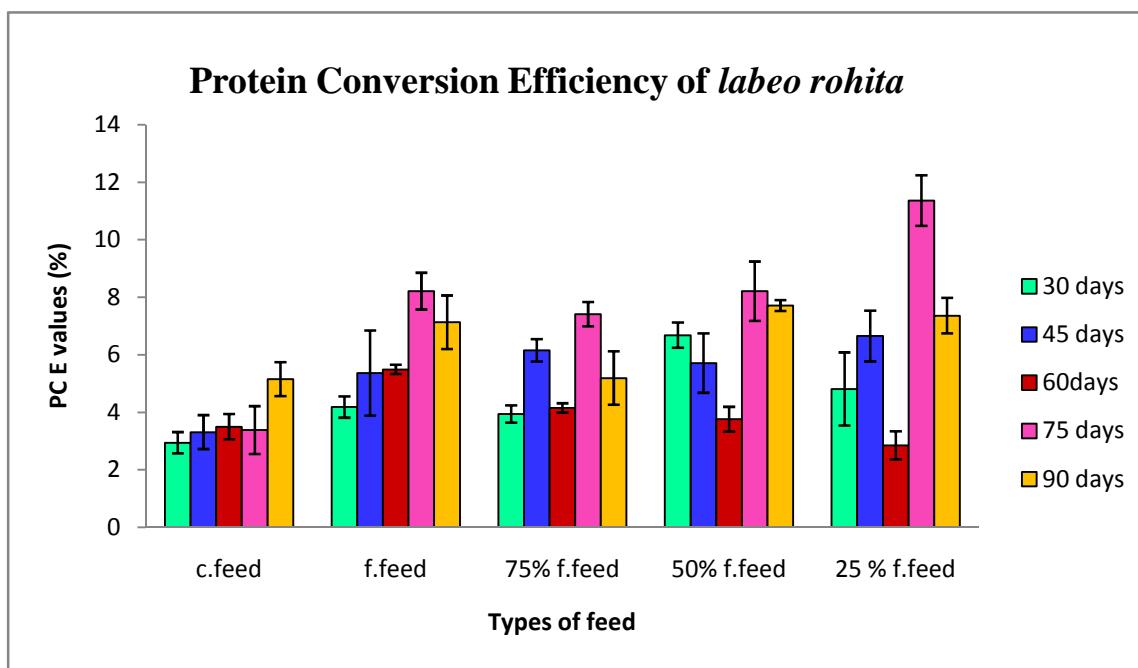
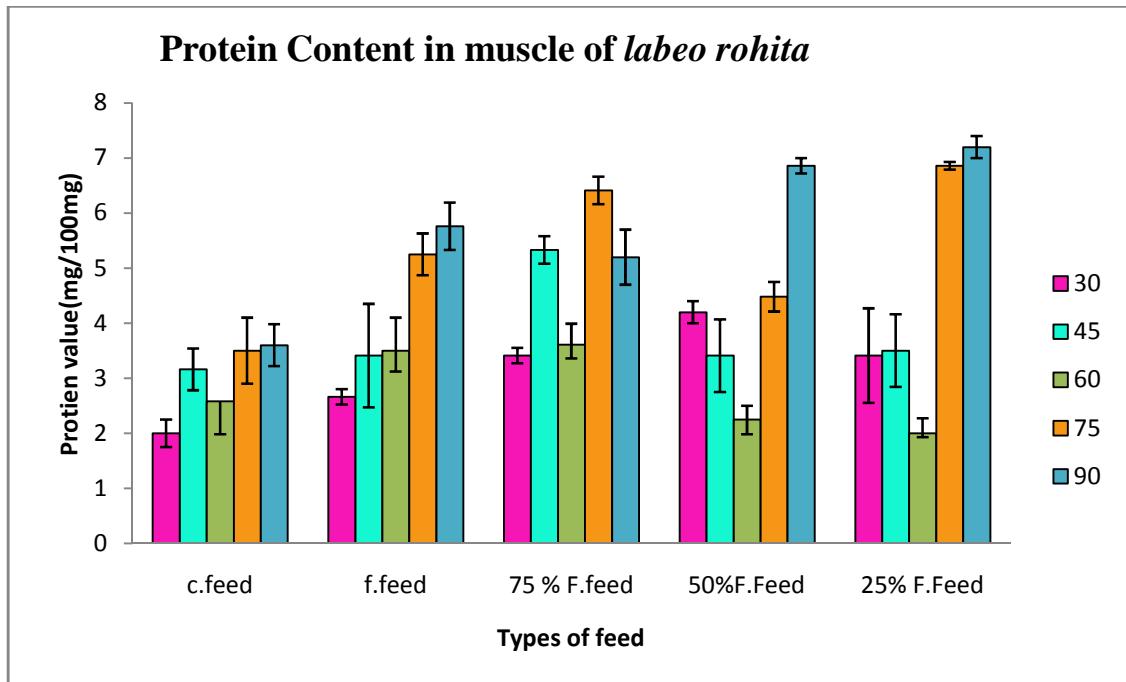
Sr. No	Days	Conventional feed	Formulated feed			
			100%	75%	50%	25%
1	30 days	2±0.38	2.66± 0.38 NS	3.41 ± 0.38 *	4.20 ± 0.60 ***	3.41 ± 0.38 *
2	45 days	3.16±0.14	3.41± 0.94 NS	5.33 ± 0.14 **	3.41 ± 0.38 NS	3.5 ± 0.43 NS
3	60 days	2.58 ± 0.14	3.50±0.25 *	3.61 ± 0.10 **	2.25 ± 0.25 NS	2 ± 0.50 ***
4	75 days	2.53 ± 0.20	5.25 ± 0.66 ***	6.41 ± 0.38 ***	4.48 ± 0.27 ***	6.83 ± 0.14 ***
5	90 days	3.5 ± 0.86	5.76 ± 0.66 **	5.20±0.20 *	6.86 ± 0.07 ***	7.2 ± 0.20 ***

Table 3: Protein Conversion Efficiency (%) of Muscle of freshwater fish *Labeo rohita* fed on Conventional and Formulated feed.

Sr.No	Days	Conventional feed	Formulated feed			
			100%	75%	50%	25%
1	30 days	2.94±0.37	4.18±0.59 NS	3.94±0.44 ***	6.68±0.83 NS	4.81±0.59 *
2	45 days	3.31±0.37	5.36±1.48 NS	6.15± 0.16 *	5.71±0.64 *	6.65±0.93 **
3	60 days	3.50± 0.30	5.49± 0.39 NS	4.15± 0.16 NS	3.76±0.42 NS	2.85±0.93 *
4	75 days	3.38±0.44	8.21±1.03 ***	7.41±0.43 ***	8.21±1.03 ***	11.36±0.19 ***
5	90 days	5.15±1.27	7.13±0.88 NS	5.19±0.49 NS	7.71±0.88 NS	7.68±0.62 *

Moreover, the animal by product such as blood meal has been recognized as a valuable feed. It is rich source of essential amino acids for pigs and poultry (Crawshaw, 1994), and fish (Otubusin, 1987; Crockford, 1998, Hardy, 2006).

Fish culturist reported that blood meal is better and reasonable balanced diets for fish. Therefore it is included in fish farming industry. It is preferred by fish farmers worldwide for increasing fish production within short time. From obtained results, we concluded that, the formulated feed will give superior fish growth at low cost.



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