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Amino Acid Analysis and Body Composition of *Labeo rohita* Fed on Animal Protein Sources

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Abstract – **Twelve week experiment was conducted to evaluate the amino acid availability and proximate body composition of *Labeo rohita*. The body meat of fish was analyzed for proximate body composition and amino acid availability. In case of analyzed amino acid high deposition of lysine, glycine, histidine and methionine were found in body meat of fish fed on reference diet while aspartic acid, alanine, glutamic acid and cystine was high in body meat of fish treated with meat meal test diet T_1 and in body meat of fish raised on bone meal test diet T_2 the value of valine and leucine was highest. The deposition of dry matter was highest (96.00±1.00) in body meat of fish fed reference diet followed by test diet T_2 -bone meal (94.50±0.00) and (91.00±0.00) in test diet T_1 meat meal. The crude fat was also high (22.65±1.10) in body meat of reference diet followed by (20.48±0.03) in T_2 and (17.75±0.75) in T_1. While deposition of crude protein was highest (57.7±0.18) in body of fish fed on bone meal followed by (55.23±0.55) in meat meal and (51.30±1.01) in reference diet. Crude fiber was highest (7.68±0.49) in body meat of fish treated with meat meal followed by (7.21±0.60) with bone meal and (4.24±0.67) with reference diet. The gross energy was also highest (496.51±2.62) in fish fed on meat meal followed by (462.43±0.70) in bone meal and (376.61±2.49) in body of fish treated with reference diet. While ash was highest in body meat of fish fed on bone meal (28.50±0.50) followed by (25.00±0.00) in meat meal and (23.00±1.00) in reference diet. The findings of present study revealed satisfactory growth, feed utilization and high profile of amino acids through replacement the fish meal by bone meal and meat meal in the diets of *Labeo rohita.***

Keywords – ***Labeo rohita*, Meat Meal, Bone Meal, Body Composition, Amino Acid.**

I. Introduction

Food is the essential need and basic right of all living organisms but malnutrition is the biggest problem in rapidly increasing world population, especially shortage of protenaceous food (like fish) in terms of quantity and quality. Due to health awareness and population growth, consumption of fish has been increased, with an annual growth rate of around 7% and this consumption rate makes aquaculture one of the fastest growing animal feed producing sector [1]. Aquaculture production acts as a bridge between food shortage, critical consumer demand and healthy life of people but due to artificial feed fish cultivation become very expensive [2]. The Fish with common name "rohu" and scientific name *Labeo rohita* (Hamilton) is a prime carp species culture on large scale in Pakistan. It is very important to formulate specific feed according to the palatability and growth performance of every species [3]. Various animal proteins are derived by recycling of different animal waste material associated with slaughtering operations, condemned organs and inedible offal, such as meat meal and bone meal. Meat meal and bone meal mostly contain those parts which are not edible by human beings [4]. Nutritional quality of commercial meat meal and bone meal extremely depends upon type of raw material so, there are many variations in the chemical composition and protein quality in the meat industry but meat meal and bone meal is used as major animal protein sources from many last year's [5].

II. Materials and Methods

The experimental trial was conducted in Research Laboratory, Department of zoology, Wildlife and Fisheries, Government College University, Faisalabad, Pakistan.

2.1 Experimental Fish

The fingerlings of *Labeo rohita* was purchased from fish seed hatchery, Satiana road, Faisalabad. The fingerlings were acclimatized with reference diet for one week in glass aquaria. Fingerlings were fed at the rate of 4% live wet body weight twice a day.

2.2 Feed ingredients and diet preparation

Each test diet was composed of 70% reference diet and 30 % test ingredients (meat meal and bone meal). Chromic oxide was used as an inert marker for digestibility measurement of different ingredients. For diet preparation, different feed ingredients viz, fish meal, rice polish, wheat bran, rice broken; meat meal and bone meal were purchased from a commercial feed mill. The reference diet was prepared by linear formulation method using Win feed 2.6 (Win Feed (U.K., Ltd.,) Cambridge, UK). The diets were prepared by following the [6].

2.3 Feeding protocol and fecal collection

After acclimatization of one week, fingerlings were transferred to glass aquaria via interspersion. For each treatment reference diet, test diet- T_1 (meat meal) and test diet- T_2 (bone meal) two replicates were used and in each replica fifty fingerlings were stocked. Fingerlings were stocked with average weight of 8-10 gm. Reference and test diets were given at the rate of 4% live wet body weight twice a day (morning and afternoon) in the feeding aquarium [7]. After a feeding session of 2-3 hours, fingerlings were shifted in adjacent aquaria for the collection of fecal matter. Care was taken to avoid breaking of the thin fecal strings in order to minimize the nutrient leaching. The fecal matter was collected on daily basis, and the collected fecal matter from each replica was dried on daily basis at 60 ºC in an oven [8]. Fecal collection was continued for till a sufficient amount of sample about 10 g were collected for chemical analysis. During the trial fingerlings were taken from each replica

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on fortnight basis to determine the body weight and total body length to observe their growth performance.

2.4 Analytical method

A representative sample of feed, oven dried feces and body meat was homogenized using a motor and pestle and analyzed chemically by [9] procedures: dry matter (DM) by oven drying at 105 °C; crude protein by microkjeldahl analysis and gross energy by oxygen bomb calorimeter. Lipid by chloroform methanol extraction method [10] through 10454 soxtec system HTz. Chromic oxide in dried samples of feed and feces was determined according to the procedure described by [11] through UV/VIS2001 spectrophotometer. For the analysis of amino acid the sample of diet and body meat were hydrolyzed in 6N HCL at 110 ℃ for 22 hours [12] and amino acids were determine through paper chromatography and ash was analyzed by electric furnace, at 650 ℃ for 4 hour.

III. Results

Body meat of *Labeo rohita* was analyzed to determine the effect of animal feed ingredients (meat meal and bone meal) on the body composition of *Labeo rohita.* Maximum % of dry matter was observed in body meat of fish treated with reference diet (96.00±1.00) followed by test diet- T_2 bone meal (94.50±0.00) and (91.00±0.00) test diet- T_1 meat meal. The highest value of crude fat deposition was (22.65±1.10) in fish body meat fed on reference diet followed by test diet-T_2 (20.48±0.03) and lowest value (17.75±0.75) by test diet- T_1.

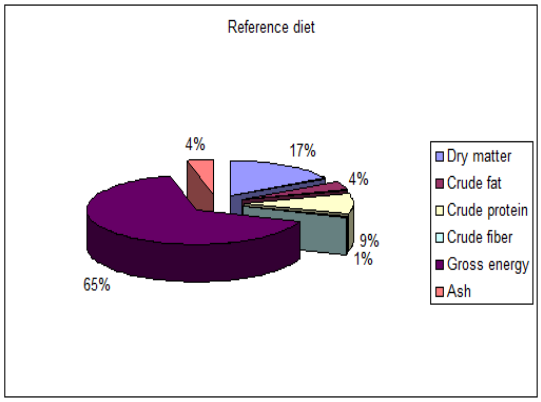

Fig.1. Composition of fish body meat (Labeo rohita) treated with reference diet.

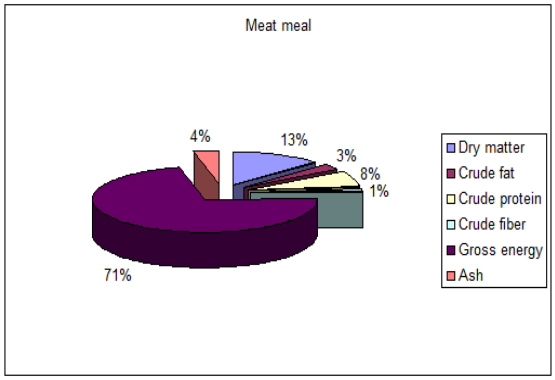

Fig.2. Composition of fish body meat (Labeo rohita) treated with test diet-1 (meat meal).

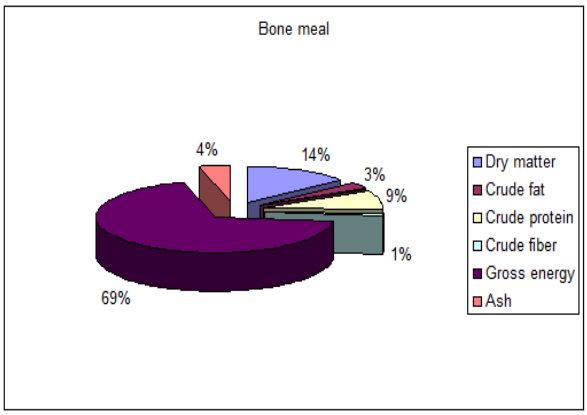

Fig.3. Composition of fish body meat (Labeo rohita) treated with test diet-2 (bone meal).

The % of crude protein deposition was maximum (57.78±0.18) in body meat of fish reared on test diet- T_2 followed by test diet- T_1 (55.23±0.55) and (51.30±1.01) in reference diet. The % of crude fiber was observed highest in the body meat of fish fed on test diet-T_1 (7.68±0.49) followed by test diet- T_2 (7.21±0.60) and reference diet (4.24±0.67). Gross energy % was highest for test diet-T_1 (496.51±2.62) followed by test diet-T_2 (462.43±0.70) and reference diet (376.61±2.49), respectively. The result of ash showed highest % (28.50±0.50) for test diet- T_2 followed by test diet- T_1 (25.00±0.00) and reference diet (23.00±1.00). Analysis of variance on analyzed nutrients of body meat for labeo rohita (see Table.1)

Table 1:- Analysis of variance (mean squares) on analyzed nutrients of body meat for Labeo rohita.

Treatment	Dry Matter	Crude Fat	Crud Protein	Crude Fiber	Gross Energy	Ash
Reference diet	96.00±1.00A	22.65±1.10A	51.30±1.01B	4.24±0.67B	376.61±2.49B	23.00±1.00B
T_1 (Meat meal)	91.00±0.00A	17.75±0.75B	55.23±0.55A	7.68±0.49A	496.51±2.62A	25.00±0.00B
T_2 (Bone meal)	94.50±1.50A	20.48±0.03AB	57.78±0.18A	7.21±0.60A	462.43±0.70B	28.50±0.50A

Means sharing similar letter in a column are statistically non-significant (P>0.00)

3.1 Analyzed amino acid composition of body meat of Labeo rohita

Analyzed amino acid profile in body meat of *Labeo rohita* reared under different treatments like reference diet, meat meal and bone meal (see Table 2). The recorded deposition of lysine was highest in body meat of fish reared on reference diet (8.45) followed by meat meal (5.38) and bone meal (5.13). The recorded value of aspartic acid was highest in body meat of fish reared on

test diet- T_1 (meat meal). The calculated amount of isoleucine was highest (7.74) in body meat of fish reared on test diet- T_2 (bone meal). The value of glycine was highest in body meat of fish reared on reference diet (1.47). Recorded value of valine was highest (1.85) in body meat of rohu reared on test diet-T_2. Calculated deposition of alanine in body meat of test diet-T_1 (meat meal) was highest (3.89) while the amount of glutamic acid was highest (1.68) in body meat of test diet- T_1. The recorded deposition of histidine was highest in body meat of reference diet (5.04) and the highest value of leucine was (3.58) in body meat of fish fed on test diet-T_2. The recorded amount of cystine was highest (8.15) in body meat of fish reared on test diet- T_1. The recorded deposition of methionine was highest in body meat of fish reared on reference diet (1.31).

IV. Discussion

The value of dry matter deposition in fish body meat was higher (96.00±1.00) in reference diet, followed by test diet- T_2 bone meal (94.50±1.50) and test diet- T_1 meat meal (91.00±0.00), respectively. Not only the protein contents present in a fish determine the quality of fish meat but crude fat evaluation is also necessary and result of this study revealed that deposition of crude fat content in the body of *Labeo rohita* was highest in reference diet (22.65±1.10). Commonly it is considered that animal protein sources meat meal and bone meal are rich in saturated fats but some time increased in saturated fats reduce the fish feeding it might become the reason of decrease crude fat content in body meat of rohu that was fed on meat and bone meal [13] and the results of current study are agreed with this situation. The crude protein content deposition in body meat of rohu was highest in the test diet- T_2 (57.78±0.18) the results are agreed with findings of [14] they showed the highest digestibility of meat meal but some time these results not agree with findings of other researchers because their might be any problem during procedure of feed preparation or difference in feeding protocol [7]. Test diet- T_1 showed highest value of crude fiber (7.68±0.49) in body meat of *Labeo rohita* and results are similar with [14] because there are high fiber contents present in animal protein sources as compare to plant sources. Among different treatments the level of gross energy was highest in test diet- T_1 (496.51±2.62), the value of gross energy was highest in meat meal, it might be due to rich amino acid profile [14]. Ash retention was observed better in test diet- T_2 (28.50±0.00). In another study the content of ash were also found high in animal protein source, it was might be due to high concentration of minerals in animal protein sources [15]. Calculated deposition amino acid profile was reported in the current study and body meat showed highest concentration of lysine (8.45) and lowest concentration of valine (0.38) while in body meat of fish reared on test diet- T_1 the highest concentration was recorded for cystine (8.15) and minimum concentration of methionine (0.68) and calculated concentration of fish reared on test diet- T_2 was highest for isoleuceine (7.74) and lowest for methionine (0.58).

Table II: Analyzed amino acid composition of body meat of Labeo rohita (mean ± SE., n=2).

Diets	Lysine	Aspartic Acid	Isoleucine	Glycine	Valine	Alanine	Glutamic Acid	Histidine	Leucine	Cystein	Methionine
Reference diet	8.45±0.45A	1.57±0.32A	1.11±0.01B	1.47±0.07A	0.38±0.02B	1.98±0.04C	1.43±0.03B	5.04±0.06A	3.05±0.25A	1.12±0.01B	1.31±0.02A
T_1 (Meat meal)	5.38±0.12B	2.05±0.05A	1.36±0.30B	1.12±0.01B	1.60±0.20A	3.89±0.01A	1.68±0.02A	1.89±0.01B	2.36±0.29A	8.15±0.36A	0.68±0.02B
T_2 (Bone meal)	5.13±0.15B	1.26±0.14A	7.74±0.74A	1.14±0.04B	1.85±0.06A	3.06±0.02B	1.49±0.01B	1.05±0.01C	3.58±0.08A	1.78±0.03B	0.58±0.01C

Means sharing similar letter in a column are statistically non-significant (P>0.05).

V. Conclusion

The findings of present study revealed satisfactory growth and high profile of amino acids through replacement the fish meal by bone meal and meat meal in the diets of *Labeo rohita*..

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