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Data analysis of protein, moisture, ASH and FAT profile of the fishes of upper Ganga

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Abstract
A comparative study on the content of Protein, moisture, ash and fat four Indian fishes *Labeo rohita, Cirrhina mrigala, Hypopth almicthy molitrtx, Tor putitora* were carried out in the present study. The proximate analysis revealed that the protein content *Labeo rohita ,Cirrhina mrigala ,Hypopth almicthy molitrtx, Tor putitora* of 25.077%, 15.993%, 5.23%, 47.907% (% of wet weight), respectively. The total fat content was generally high, ranging from 16.46 % to 20.675% and ash ranged from 1.85% to 13.467 %. Moisture content varies from 78.06% to 65.83%. This result evidently shows that the importance of fish contain large amount of nutrients which help in fighting against mal nutrient problems which is very common problem in children.

Keywords: protein, *Labeo rohita, Cirrhina mrigala, Hypopth almicthy molitrtx, Tor putitora*

Introduction

The per capita consumption of fish has been 3.2 kg on an average upto 1992 (5.13 kg for fish eating population/year) as against projected requirement of 11.0 kg. Pisciculture has the capability of popularity due to its on-the-spot food characteristic, balanced nutrients and above all, reasonable price.

Fish is rightly considered as the "Poor man's diet." It costs much less in comparison to its food value. It is an almost zero-carbohydrate food, good for diabetics and other such. Fish is a rich source of protein, vitamins and minerals with approximate composition as crude protein 14.2-22.8%, fat 0.6-2.4% and energy 76-161 Kcal/100 gm. [1]

A special feature of fish flesh food is content of vitamin B_{12} which is almost absent in plant food and also a good source of calcium and vitamin A. Fish also contains poly unsaturated fatty acids which are known to offer safety against cardio vascular diseases.

This has got advantages over the other meat food. Fish proteins comprise all the ten essential amino acids in desirable strength for human consumption, namely lysine (high concentration), arginine, histidine, leucine, isoleucine, valine, threonine, methionine, phenylalanine and tryptophan [2]. This accounts for the high biological value (BV) and protein efficiency ratio (PER) of fish flesh than the other flesh food like meat.

Fish has a BV, net protein utilised (NPU) and PER of 80, 74 and 35, respectively as compared to meat (74, 76 and 3.2). Further, unsaturated fatty acids belonging to limolinic acid series, present in fish flesh and fish oils are considered to be essential for the prevention of coronary heart disease.

Fish contains almost all the essential Ethanol acids that man requires. Lysine and methionine amino acids are present in high amounts [3]. The protein content of the fish flesh varies with feeding habits, age and sex of the fish. Fin fishes contain high amount of protein about 18-22 g per 100 gm of edible flesh (average value).

Lipid composition of fishes varies greatly. Many of the fatty acids are long chain molecules with more than 18 carbons atoms Unsaturated fatty acid content is high. The fish flesh also contain polyunsaturated fatty acids. The lipid content of the species depends on geographic origin, physical parameters, availability of food and physiological state of the animal. Lipid water and protein content of fish is closely interrelated.

When the fat content is high, moisture level and protein content will be relatively lower. Polyunsaturated fatty acids have important nutritional value. [4] Fish lipids contain about 2.9% linoleic acid, which is required for growth and maintenance of normal body functions in man.

Ash weight of fish ranges from 0.4 gm to 1.5 gm per 100 gm body weight. Ash contains important minerals like Na, K, Fe, Ca, P, Mg, I, Co etc. Fresh water fishes contain less values of Na than salt-water fishes. The average value of Na content is 60-mg/100 gm of fish muscle. Ca content varies from 5 mg. to 200 mg. with an average value of 30 mg/100 gm offish weight Ca is an essential element for proper function of muscles and growth of bone in man. Phosphorous is also present in adequate amount in fishes [5]. The value is 200 mg/100 gm of flesh. Another important element present in fish flesh is Mg which works as an activator of enzymes in the metabolism of carbohydrates. The fish muscle and gills accumulate Mg salts.

Fe and Cu are important elements needed for our body. Fish contains about 1 mg. of Fe/100 g of body weight. Cu is present at values from 0.04 mg to 0.6 mg/100 g of flesh. I, Co, Zn and Cr elements are found in trace amounts in fish. Vitamins like Thiamine, Riboflavin, Cyanocabalamine, and Pyridoxine are present in adequate amounts [6]. Vitamin A and Vitamin D content in fishes is very popular, especially in fish liver oil extracts.

Sample Collection

Four of fresh water fishes were collected *Labeo rohita, Cirrhina mrigala, Hypopth almicthy molitrtx, Tor putitora* four samples of similar body weight and length for all analysed fish species were collected from fish market located at Dehradun, India. Prior to analysis, about 25 g of fish

muscle tissue was separated for the determination of fatty acid composition and as well as for other tests.

Methods

The following parameters were determined for above mentioned fishes which include moisture, protein, fat, ash and NFE by using the standard methods (AOAC, 1995).

Methods used for determination of moisture content

For determining the moisture content of fishes, the body of each fish was divided into two horizontal regions along the lateral line i.e. dorsal and ventral parts and samples were taken. Simultaneously the uniform proportion of the sample was also collected from all the parts of the individual fish for the determination of whole body moisture content of the fishes. The wet samples were put in pre-weight dry petridishes and then weighted again [7]. The petridishes with wet samples were kept in hot air oven for drying at 105°C for about 24 hours or until the constant weight was obtained. Then dry samples were taken out from oven and put in desiccators, after 30 minutes the weight was taken, the difference in weight (wet and dry sample) was calculated and expressed as percentage moisture content of the sample.

The percentage of moisture content was calculated by using the following formulae:

$$\text{Moisture (\%)} = \frac{\text{Wet weight of sample (g) - Dry weight of sample (g)}}{\text{Wet weight of sample (g)}} \times 100$$

The moisture free dried fish samples were grinded and finely powdered with the help of mortar and pestle for converting samples into fine powder which was used for the analysis of other parameters.

Protein

The technique employed for the estimation of crude protein content was based on slightly modifying micro-Kjeldahl's method (Jafri *et al*., 1964) 0.1–0.5 gram of sample was digested with 1:1 sulphuric acid in presence of potassium persulphate as an oxidizing agent. After complete digestion the sample was transferred in 50 ml volumetric flask and raised the volume upto 50 ml by adding double distilled water. 0.5 ml of aliquot was then taken in a test tube with Nesseler's reagent, after 10 minutes the colour developed was read on spectrophotometer at 480nm. The optical density (OD) obtained is used for estimating the crude protein (N×6.25) content of the sample [8].

Fat

Crude fat content of sample was determined by using solvent extraction technique with petroleum ether (B.P-40-60 °C) by using Soxhlet apparatus (Foss Avanti Automatic 2050, Swedan). Briefly 1-5 gm of dried fined powdered sample is placed in Whatman Thimble and defatted cotton is plugged on the top of the thimbles. These thimbles then put into the thimble holder and placed inside the machine i.e. attached with condenser. The aluminium made extraction cups were first dried and weighted. Then added 60-70 ml of petroleum ether and finally attached with thimbles already placed inside the machine. After full programming the extraction process gets started and then completing the whole extraction process, the equipment display a message that extraction is completed. Then the extraction cup containing fat content was removed from the extraction unit and placed in digital oven for about 60 minutes at 50-60 °C for the complete evaporation of petroleum ether, later on the aluminium cups containing samples were placed in desiccators for complete coolness and finally the weight was taken [9].

The total fat was calculated by using following formulae:

$$\text{Total fat (\%)} = \frac{\text{Weight of fat (g)}}{\text{Wet weight of sample (g)}} \times 100$$

Weight of fat= Weight of extraction cup with fat- Weight of empty extraction cup.

Total Ash

The ash content of the sample is the residue left after complete ashing. The fine powdered moisture free samples were taken in clean pre-weighted silica crucibles and weighted again along with samples. The crucibles containing samples was then placed in a muffle furnace at 650°C for about 4-6 hours or till the residue became completely white. The samples were then allowed to cool in desiccators for about 20-30 minutes, reweighted and the amount of ash was calculated as the difference in weight [6].

The percentage of ash was obtained by using the following formulae:

$$\text{Total ash (\%)} = \frac{\text{Weight of ash (g)}}{\text{Weight of sample (g)}} \times 100$$

Weight of ash= weight of crucible with ash sample -weight of empty crucible.

Results and Discussion

Table 1

Body Constitutes	*Labeo rohita*	*Cirrhina mrigala*	*Hypopth almicthy molitrtx*	*Tor putitora*
Moisture (%)	64.053	73.58	71.75	77.56
Protein (%)	25.077	15.993	5.23	47.907
Fat (%)	18.663	20.657	16.46	17.99
Ash (%)	13.467	1.85	5.21	2.98

Moisture

Results visibly indicated a marked variation of moisture in all the four fish species. The

Present content of all the species in the present studies varies from 64.053% to 77.56%.

Among all the species studied the Tor putitora has the maximum moisture content 77.56 which was significantly higher among all the fish species analyzed in the present species on the other hand Labeo rohita had the minimum protein content of 64.053%. [11]

Protein

Results visibly indicated a marked variation of protein in all the eight fish species. The present content of all the species in the present studies varies from 5.23% to 47.90% as shown in above table. Among all the species studied the Tor putitora

has the maximum protein content 47.907% which was significantly higher among all the fish species analyzed in the present species on the other hand Hypopth almicthy molitrtx had the minimum protein content of 5.3% [12].

FAT

In present research, Fat content varies in different fish species. Fat content reported within range of 3.9% - 16.46%. The fishes of river Ganga have highest Fat content 16.46% of *Hypopth almicthy molitrtx* and lowest fat content of 3.9% by *C. carpio communis*. Though, some species showed the variation of fat content much wider, because of the different habitats. Salam (2002) reported the variation of fat content of different fish species from 3.25% in H. fossils to 58.41% in *G. Chapra*. The present results are in good agreement with the above study in respect to the variation in fat content among different fish species. Although the inverse relationship between fat and moisture have been reported in earlier studies [13]. However, during the present study the inverse relationship between fat and moisture has been reported only in some species. Pillay and Nair (1973) marked an inverse relationship between fat and moisture content in some prawn species. Marked fluctuation in the fat constituent in some fish species indicated in the present study might be due to dependence on some factors (Borgstrom, 1961).

ASH

The ash content of the sample is the residue left after complete ashing [14]. The values obtained for the ash content in the body of different fish species varied within the range of 1.85%-13.467 %

Conclusion

Pisciculture has the capability of popularity due to its on-the-spot food characteristic, balanced nutrients and above all, reasonable price. The nutritional value of fish and fish oil has attracted a lot of public attention. It is believed to have many protective effects to various chronic diseases related with mal nutrition such as Kwashiorkor Marasmus, Anaemia and many other diseases [15]. From the present study clearly shows that all the selected Indian fishes for this study has favourable amount of protein, lipid, polyunsaturated fatty acids which are very much known to prevent all sorts of diseases. This signifies that the Indian fishes has a good oil value and is suitable for applications in pharmaceutical and food industries and further the Indian fishes have the potential to be commercialized.

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