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Nutritional Composition of Segregated Portions of *Oreochromis niloticus* from Unnichai Tank in Batticaloa District

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Abstract

Laboratory analysis conducted on the nutritional quality of the fin fish of different standard lengths in the Unnichai tank in Batticaloa yielded the following quantitative values. The protein content ranged from 8.76–23.55%. The lipid content varied between 1.89–16.77% while the element spectrum revealed that the flesh also has minerals such as Na, Ca and K. The proximate composition varies with the standard length of the fish. The same phenomenon has been found with different body parts for its composition. If the fish offal have high protein, fat suitable to the ornamental fish feed and shrimp feed preparation. This lead to reduction in the solid waste in the market.

The standard length provides a tool for fisheries management regulation to be placed for future sustainability of the fish stocks (common property resource) in the tank. The results indicate that fish of moderate size fish are economically suitable for utilization without harming the parental brood stock. Thereby catering to the future nutritional needs.

Key words: fat, *Oreochromis niloticus,* proximate composition, protein, solid wastes, Unnichai tank.

Introduction

Fish is the major source of cheap animal protein for the cereal based diet of the people in Batticaloa. Fish provide high quality protein, vitamins, minerals, lipids and carbohydrates. The major problem that confronts Sri Lanka today is to find ways and means for improving food production. Finding adequate protein supplies to meet the needs of the increasing population is thus an increasing priority. In this regard it is important to increase the protein availability by utilizing fish found in inland water bodies in addition to the marine harvests. There is an urgent need to do a biochemical analysis of fin fish in fresh and processed form. Work has been carried out to assess the chemical composition of fresh and salt dried *Oreochromis mossambicus* from Beira Lake [1]. Work has also been carried out on the period of storage and composition of tilapia flesh [2]. Nutrient composition of certain fresh water fish species in Sri Lanka has also been carried out in 1996 [3]. However, there is no recorded information relating to the composition of fish. Fish provide a source of cheap animal protein substitute in feeds developed for cattle and poultry industry in addition to aquaculture industry. If the information on proximate composition for fish parts is available, it would enhance the collection of fish offal at the site of accumulation to be converted into wise utilization. This would also encourage a healthy and clean fish market environment which will be treasured by the public.

There is much scope for developing the inland fisheries at the Unnichai tank into a productive biological resource, apart from supplying good quality drinking water to urban cities in the Batticaloa district. Therefore, the present study has been carried out to evaluate the proximate composition of skin, fin, flesh, bone etc to see whether there is any major difference in composition in relation to length and portions of the fish in different length groups.

Materials and Methods

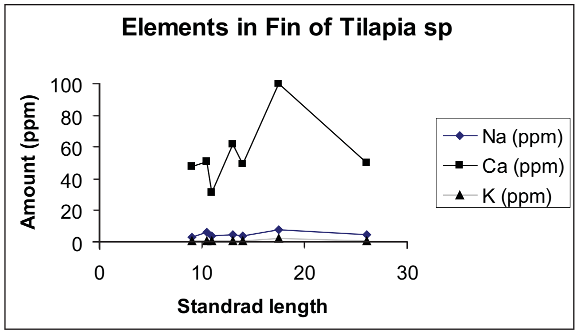
Fresh fish samples from the fish landing site at Unnichai tank were transported to the laboratory for proximate chemical analysis. Different parts of the fish such as fin, skin, vertebral column and muscles were separated from fish of different length groups. Individual samples of fin, skin, vertebral column and muscles obtained from fish were used in the study. Each sample was analyzed in duplicate. Ten grams of the individual portions were measured to the nearest mg and dried at 100˚C to a constant weight. The moisture content was estimated from the difference in weight obtained.

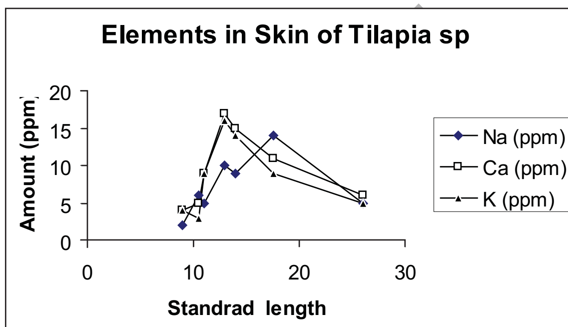
Oven dried portions were then ground and aliquots of the ground material were used for analysis. Protein content was estimated by Kejeldal method. Total fat content was determined gravimetrically according to the procedure of Folch *et al*. using Soxhlet apparatus [4]. The ash content was estimated by burning 10 g of finely ground fish portions overnight in a muffle furnace at 550˚C.

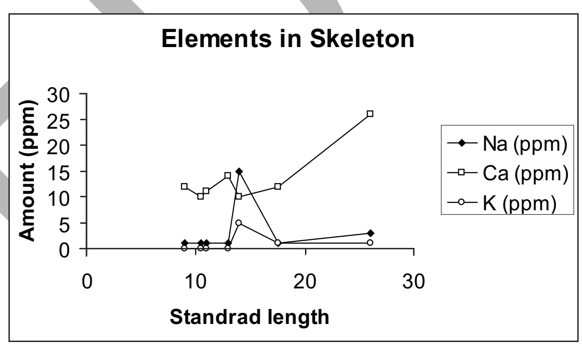
The minerals namely; Na, K and Ca were estimated by a wet digestion method using concentrated sulphuric, nitric acid in a fume cupboard.

Results

Between 45 to 53 % of the total body weight of the fish constitute the edible portion of flesh. The remaining parts are the skin, fin and vertebral column. Proximate composition of different fish parts shows variation with the standard length of the fish. Table 1 gives the proximate composition of the muscle, skin, fin and vertebral column of the *O. niloticus* at different standard length groups. The higher percentage of protein in muscles was found in fish with standard length of 10.5 cm (22.4% protein) and with the increase in length, protein content decreased considerably (15.11–19.78%). Therefore, larger fish have moderately high protein content in flesh (17.24%). Moderate amounts of protein are found in the skin (11.9–22.68%) and higher protein levels are found in fin (23.55%) and vertebral column (24.41%). The fat content of the flesh is a moderate (1.89–4.9%), higher in skin (2.27–9.34%) and highest in vertebral column. The minerals such as Na, Ca and K are found at different levels in fish of different length. However, the larger fish are found to have a higher Ca and Na content in flesh at the same time the fin shows the same trend. The skin was at higher Ca and Na fish among fish of small length groups (Fig 1).


Elements in Fin of Tilapia sp
Amount (ppm)
100
80
60
40
20
0
0
10
20
30
Standrad length
Na (ppm)
Ca (ppm)
K (ppm)


Elements in Skin of Tilapia sp
Amount (ppm)
20
15
10
5
0
0
10
20
30
Standrad length
Na (ppm)
Ca (ppm)
K (ppm)


Elements in Skeleton
Amount (ppm)
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25
20
15
10
5
0
0
10
20
30
Standrad length
Na (ppm)
Ca (ppm)
K (ppm)

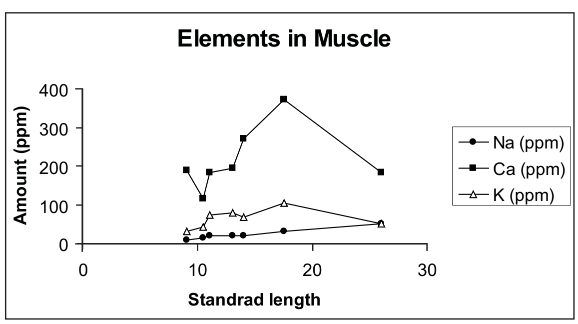
Elements in Muscle
Amount (ppm)
400
300
200
100
0
0
10
20
30
Standrad length
Na (ppm)
Ca (ppm)
K (ppm)

Fig 1:- Variation in mineral composition in different portions of fish with varying standard length.

Table 1:- Proximate composition of different body parts of *O. niloticus* in Unnichai tank.

Standard length (cm)		**Ash (%) M ± SD**	**Moisture (%) M ± SD**	**Protein (%) M ± SD**	**Fat (%) M ± SD**
9		0.66 ± 0.25	69.6 ± 1.26	20.4 ± 2.1	9.34± 1.1
10.5		3.2 ± 0.35	79.7 ± 1.3	14.26 ± 1.1	2.84 ± 1.0
11	Skin	1.25 ± 0.50	79.4 ± 1.5	14.36 ± 1.56	4.99 ± 1.1
13		0.4 ± 0.60	76.4 ± 0.96	11.9 ± 1.76	11.3 ± 0.95
14		1.4 ± 0.25	73.7 ± 1.45	20.27 ± 1.54	4.63 ± 1.3
17.5		1.02 ± 0.11	72.4 ± 1.34	22.68 ± 1.43	3.9 ± 1.0
26		2.6 ±1.0	74.5 ± 1.45	20.63 ± 1.34	2.27 ± 0.75
9		2.35 ± 0.25	70 ± 1.69	22.89 ± 1.25	4.76 ± 0.79
10.5		2.23 ± 0.33	74.7 ± 1.75	20.73 ± 1.15	2.34 ± 1.1
11	Fin	2.58 ± 0.13	80.4 ± 1.98	13.18 ± 1.65	3.84 ± 0.79
13		3.43 ± 0.15	71.9 ± 2.14	22.63 ± 1.45	2.04 ± 0.45
14		4.03 ± 0.15	75.4 ± 2.33	16.59 ± 1.97	3.98 ± 0.55
17.5		1.99 ± 0.17	69.7 ± 2.4	23.55 ± 1.56	4.76 ± 0.78
26		2.11 ± 0.21	67.8 ± 2.1	23.63 ± 1.45	6.46 ± 0.99
9		1.24 ± 1.1	81.0 ± 2.45	13.56 ± 2.45	4.2 ± 1.0
10.5		2.0 ± 0.97	70.1 ± 1.97	22.4 ± 1.98	5.5 ± 1.23
11		1.43 ± 0.98	76.9 ± 1.79	19.78± 1.74	1.89 ± 1.45
13	Muscle	1.23 ± 0.75	75.3 ± 1.24	8.76 ± 1.35	4.71 ± 1.21
14		2.11 ± 0.89	75.4 ± 1.43	17.93 ± 1.34	4.56± 1.67
17.5		1.89 ± 0.19	78.1 ± 1.23	15.11 ± 1.87	4.9 ± 1.98
26		2.16 ± 0.76	76.5 ± 1.98	17.24 ± 1.43	4.1 ± 1.92
9		1.98 ± 0.95	63.9 ± 2.25	21.36 ± 1.99	12.76 ± 1.21
10.5		2.1 ± 1.05	68.7 ± 2.11	18.11 ± 1.37	11.09 ± 1.05
11		1.37 ± 1.04	59.8 ± 1.45	22.13 ± 1.93	16.7 ± 1.09
13	Vertebral column	1.57 ± 1.25	64.5 ± 1.95	22.83 ± 1.78	11.1 ± 1.11
14		2.09 ± 1.55	61.2 ± 1.92	24.41 ± 1.92	12.3 ± 1.78
17.5		2.21 ± 1.25	70.1 ± 1.75	17.49 ± 1.74	10.2 ± 1.87
26		1.35 ± 1.22	67.9 ± 1.47	16.35 ± 1.99	14.4 ± 1.93

Discussion

As far as nutrition is concerned, the value of fish lies as a source of good protein and able to reduce/prevent malnutrition, especially during early childhood. The fat content is characterized by a high level of polyunsaturated fatty acids with 3 omega fatty acids providing a healthy diet with low cholesterol [5]. The proximate composition of cichlids flesh is similar to those reported for marine fish in Sri Lanka by Peiris and Grero [6]. The values obtained during this study for different fish parts calculated as a percentage of fish weight are within a similar range (moisture 61.2-79.4 % protein 8.76- 24.41 %, lipid 2.27-12.76% and ash 0.4-4.03% for the different parts). Hence, these fish could be recommended as a cheap nutritional substitute. The parts have different proximate values and they change according to the length of the fish. Smaller fish have a high protein content and low lipid content in the muscles. Protein constitutes the highest source of metabolizable energy and is the most important nutritional component of the flesh.

In the cooking process the skin is removed and prepared for different dishes. But the amino acids of tissues adjacent to the skin have medicinal properties. However, the proximate composition revealed that the highest protein content is found in the fin of the fish, followed by vertebral column, skin and muscle. Higher protein content is found in fins which are not consumed by humans. These fish portions can be used as raw materials for feed production for poultry, cattle, shrimps and ornamental fish. This promotes the utilization of fish offal for animal feed production. Smaller fish were found to have a higher fat content and moderate sized fish were found to have a lower fat content. Therefore, it is important from the point of fisheries resource management not to remove smaller fish but to harvest medium or large fish. The percentage composition varies with the length of the fish indicating that the medium sized fish have a higher energy value than larger fish. This information would contribute to implement mesh size regulation in uncontrolled fishery to limit the capture of smaller fish than medium sized and larger fish.

The proximate composition of fish is known to be influenced by a number of factors associated with both physiological condition of the fish and the external environment. De Silva [1] has shown that the proximate composition of *O. mossambicus* falls within a wide range during different stages of maturation and that it also changes significantly during maturity and spawning.

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