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Research Article

BIOCHEMICAL ANALYSIS OF FRESH WATER FISH SPECIES OF VEERANAM LAKE, CUDDALORE DIST, TAMIL NADU, INDIA

A. Arunachalam[1]*, N. Nanthini[2], S. Malathi[2] and A. Ragapriya[2]

[1]Head, [2]M.Phil Scholar, PG and Research Department of Zoology,
Vivekanandha College of Arts and Sciences for Women, Elayampalayam,Tiruchengode, India

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ABSTRACT

Fresh water fishes *Clarias gariepinus*, *Channa punctuates*, *Glossogobius giuris*, *Oreochromis mossambicus and Xenentodon cancila* were collected from the Veeranam Lake, located at Cuddalone dist during period of January 2017 to June 2017. They were brought into the laboratory and then scarified for further studies. The tissue was processed for protein, carbohydrate and lipids estimations. It is used for the determination of their protein nutritive value of fresh water fishes. The result of the proximate composition showed as protein had a value of 13.4 ±4.4, 10.0 ± 3.8, 12.3 ± 2.6, 10.03 ± 3.8 and 11.1 ± 4.0; While carbohydrate 5.0 ± 2.3, 11.6± 1.15, 10.0± 3.4, 9.0 ±2.3, 8.3 ±2.8 and lipid 2.85 ±1.08, 2.43 ± 1.25, 4.02 ± 2.02, 1.02 ± 0.08, 2.45 ± 0.58 respectively. This result shows that taste, size and other related external appearances should not be the only factors to be considered in making choice for marketing and consumption of fishes. The result obtained in this study has provided scientific information and detailed knowledge of the proximate composition of these five important fish species.

Keywords: Biochemical Analysis, Nutritive Value, Fresh Water Fishes, Veeranam Lake.

INTRODUCTION

The fresh water fishes are commercially important fish due to its food value.Fish has been widely accepted as a good source of protein and other elements for the maintenance of healthy body (Adeniyi *et al*., 2012). The fishery is necessary for protein rich food to earn valuable foreign exchange (Varadharajan *et al*., 2013). The Fish are quite different from the other animal food sources. They provide calories with high quality proteins, which contain all essential amino acids in easily digestible form. So, they are beneficial nutrition sources (Weatherly and Gill, 1998).

In India, biochemical constituents of fishes have been analysed mainly for the nutritive value of fishes. Fish protein are relatively high digestibility and considered to have high biological and growth promoting value (Shekkar *et al.*, 2004), which comprises of all the ten essential amino acids in desirable quantity for human consumption (Bhilave *et al.*, 2013).

Now a day's consumer wants to know and ensured the nutritional value of the products what they are eating. In general, the biochemical composition of the whole body indicates the fish quality. Therefore, proximate biochemical composition of a species helps to assess its nutritional and edible value in terms of energy units compared to other species. Variation of biochemical composition of fish flesh may also occur with same species depending upon the fishing ground, fishing season, age and sex of the individual and reproductive status.

Knowledge of biochemical composition is of great help in evaluating the nutritional value of species not only fishes but also helps in quality assessment and optimum utilization of these natural resources (Rodriguez-Gonzalez *et al*., 2006). Biochemical investigations on fish help to evaluate the impact of environment. Biochemical studies of fish tissues are of considerable interest for their specificity in relation to the food values of the fish and for the evaluation of their physiological needs at different periods of life. A study of the nutrient values of fresh water fish is important fish processing industries such as production of dry fish, canning and preparation of fish meals.

Nutritional and physical characteristics of diets can modulate susceptibility of fish to infectious diseases. In the most severe cases, diets that are inadequate with respects to an essential nutrients (Protein, Amino acids, Essential fatty acids, Vitamins and Minerals) leads to gross malnutrition

*Corresponding Author: Dr. A. Arunachalam, Head, Department of Zoology, Vivekanandha College of Arts and Sciences for Women, Elayampalayam, Tiruchengode, India, Email: arunachalam5452@gmail.com

and high disease susceptibility. About 63% animal proteins are supplied from fish (Dof, 2002). This has led to over fishing of many of the more traditional species and required governmental intervention to prevent the collapse of important species (Hultin, 2005). Lipids are of great important not only to fish nutrients but also to human nutrition. So, the present investigation was carried out in order to assess the proximate composition of fresh water fishes through the laboratory analysis.

MATERIALS AND METHODS

Area Description

Veeranam Lake (Veeranaaraayanapuram Lake) is located 14 km (8.7mi) SSW of Chidambaram in Cuddalore district in the state of Tamil Nadu, India, 1 km (0.62 mi) away from Sethiyathope. The lake located 235 km (146 mi) from Chennai, India, is one of the water reservoirs from where water is planned to be supplied to Chennai. The location of this tank is between latitudes 11 15 ‘ E and 11 25’ E and Longitudes 79 30’ N and 79 35’ N. Veeranam Lake was built in the Tenth Century during the nine of Greater Cholas, from 907-955 AD and is an 16-kilometre (9.9 mi) long dam in northern Tamil Nadu. This Veeranamlake gets water from Kollidam via Vadavaru River. The lake remains dry for the major part of the year. This is the Veeraanam Lake formerly known as Veemnaaraayanapuram Lake. The lake has a capacity to store about 1,465 mcft of water.

Specimen Collection

Samples were collected from Veeranam Lake by using multi-panel, mum-filament experimental nets. This technique is known as ‘nonselective’ fishing technique and involves using nets with different mesh sizes, from 16 w 150 mm stretched mesh, so that the samples are representative of the fish population. The nets were set forapproximately 12 hour over night U800 0600 h; and removed the next day. Then, Fish were removed from the different panels and sorted according to species and size in separate bowls. From each bowl, individual fish samples were identified to species level. The species of are *Clarias gariepinus,Channa punctatus, Glossogobius giuris, Oreochromis mossambicus* and *Xenentodon cancila,* were collected from the study area and transported to the laboratory for the biochemical analysis.

Sample collection

A maximum of 6 fishes were collected, and their tissues composited for analysis. Collected fish must be handled by personnel wearing latex gloves and placed in clean, well labelled polyethylene bags. Fish must also be dissected with thin 3 hours of capture. Fork length (mm) and muscles tissues (skin removed) were collected from the left side of each fish, above the lateral line, and between the dorsal and caudal fins. Then the muscles were well grinded by mortar. Samples was placed in individual jars for each type of fish tissue, and frozen immediately after dissections.

Samples of analysis

In the laboratory, the fish samples were identified using the taxonomy keys by Reed *et al.* (1967) (Table 1). The identified samples were then labelled in triplicates. In the laboratory, measurement of the standard length, total length and weight were recorded. Distance from the tip of the snout or the anterior-most part of the head to the hyporal bone. Distance from the anterior most part of the head to the posterior most part of the tail (usually tip of the caudal fin). Fish samples were weighed on Triple beam balance 2610 g and electronic digital balance LP 503.

Figure 1. The different views of the study area, Veeranam Lake.

Table 1. Taxonomy of the collected fishes.

Sl. No.	Name of the species	Family	Order	Class
1	*Clanasganepmus*	Clariidae	Siluriformes	Actinopterygii
2	*Channa panorama*	Channidae	Perciforms	Actinopterygii
3	*Glossogobiusgiuris*	Gobinae	Perciforms	Actinopterygii

4	*Oreochromismossambicus*	Cichlidae	Perciforms	Actinopterygii
5	*Xenentodoncancila*	Belonibae	Beloniforms	Actinopterygii

Estimation of total protein content

Protein content in the muscle was determined after trichloro acetic acid precipitation by the method of Lowry *et al*., (1951). The muscles (20 mg) were isolated and 2% homogenate was centrifuged at 3000 rpm for l5 min the supernatant was discarded and the residue was suspended in 1.0 ml of 0.1N sodium hydroxide solution. 0.5 ml of this solution equivalent to 10 mg of muscle was transferred to a clean test tube and 4 ml of copper carbonate solution was added. The thoroughly mixed contents were kept at room temperature for 30 min; the colour developed was read at 600 nm against a reagent blank in UV visible spectrometer (Jaasco model-650) Bovine serum albumin (sigma chemical co) was used to construct the standard graph. The protein content in the muscle was expressed as mg/ g wet weight of muscle.

Estimation of total carbohydrate content

Carbohydrates and non-protein compounds are present in negligible amount and are usually ignored for routine analysis. The carbohydrate content was estimated by the technique of Roe (1955). A 10% homogenate of muscle was prepared using 5% TCA and this was centrifuged at 3000 rpm for 10 minutes. Samples were cooled in the dark at: room temperature for 30 minutes. The supernatant was collected and the Optical density was measured in a spectrophotometer (Hitachi 2205) at a wave length of 620 nm a blank reading. Blank was prepared by mixing 1 ml of distilled water with 4 ml of burette reagent. The carbohydrate content was express as mg/g of muscle.

Estimation of total lipid content

The total lipids were estimated by the method of Foich (1957) to find out total lipid, known volume of experiment samples were homogenized with 1 ml of methanol and 2 ml of chloroform to which again 2 ml of chloroform: methanol (2:1 v/v) was added and mixed thoroughly. To this, 0.2 ml 0.09% sodium chloride solution was added. The above mixture was poured in to separately funnel, mixed and allowed to stand for few hours. The lower phase was separately and 0.5 ml of extract was measured and poured into a clean test tube. It was allowed to try in vacuum dedicators over silica gel, dissolved in 0.5 m1concentrated sulphuric acid and mixed well. The tube was plugged with non-absorbent cotton wool and placed in a boiling water bath for 10 minutes and the tubes were cooled at room temperature. 0.3 m1 of this acid digest was taken for experimental analysis. 0.5 mg of cholesterol for stand and 0.5 m1 of distilled water for blank separately. To each tube, 5ml of vanillin reagent was added. Mixed well and allowed to stand for half an hour and the developed colour were measured at 250 nm. The lipid content was express as mg/g of muscle.

RESULT

The protein, carbohydrate and lipid contents were analysed in the collected fresh water fishes (Table 1).

The total protein content in muscle of *C. gariepinus, C. punctuates, G. giuris, O. mossambicus and X. cancila* were 13.4 ± 4.4; 10.0 ± 3.8; 12.3 ± 2.6; 10.0 ± 3.8 and 11.1 ± 4.0 mg/g respectively. The protein content in individual contribution were *C. gariepinus*> *G. giuris*> *X. cancila*> *C. punctuates* and *O. mossambicus* were respectively.

The total carbohydrate content in muscle of *C. gariepinus, C. punctuatus, G. giuris, O. mossambicus* and *X. cancila* 5.0±2.3, 11.6 ± 1.15, 10.0 ± 3.4, 9.0 ± 2.3 and 8.3 ± 2.8mg/gm., were respectively. The total Carbohydrate content in individual contribution were *C. punctuates* >, *G. giuris*>, *O. mossambicus, X. cancila* and *C. gariepinus.*

The total lipid content in muscle of *C. ganiepinus, C. punctuatus, G. giuris, O. mossambicus and X. cancila* were 2.85±1.08, 2.43 ± 1.25, 4.02 ± 2.02, 1.02± 0.08 and 2.45 ± 0.58 mg/gm were respectively. The total lipid content in individual contribution were *G. giuris*> *C. gariepinus*> *X. cancila*> *C .punctuates* > *O. mossambicus*.

Table 2. Mean values of various body constituents in the fish.

Name of the Fish	Protein content (mg/g)	Carbohydrate content (mg/g)	Lipid content (mg/g)
Clarias gariepinus	13.4 ±4.4	5.0 ± 2.3	2.85 ±1.08
Channa punctuatus	10.0 ± 3.8	11.6± 1.15	2.43 ± 1.25
Glossogobius giuris	12.3 ± 2.6	10.0± 3.4	4.02 ± 2.02
Oreochromis mossambicus	10.03 ± 3.8	9.0 ±2.3	1.02 ± 0.08
Xenentodon cancila	11.1 ± 4.0	8.3 ±2.8	2.45 ± 0.58

DISCUSSION

Biochemical studies are very important from the nutritional point of view. The biochemical constituents in animals are known to vary with season, size of the animal, stage of maturity, temperature and availability of food etc. Protein is essential for the sustenance of life and accordingly exists in the largest quantity of all nutrients as a component of the human body (Okuzumi and Fujii. 2000). An increasing demand for good quality animal protein for the exploding population has led to effective and increasing exploitation

of the aquatic resources. The acceptability and easy digestibility of fish proteins make it very valuable in combating protein nutrition, especially in children. The protein of fish has a high biological value with its growth promoting capacity. Fish occupy an important part in the world protein supply, accounting for about 10% of the total protein supply. About 60% of the population in the developing countries derives 40% or more of their total animal protein supplies from fish. The average protein content of fish approximately ranges from 8 to 23g/ 100g wet edible protein. In this study, the protein content in individual contribution were as *C. gariepinus*> *G. giuris*> *X. cancila*> *C. punctuates and O. mossambieus.* The maximum level of protein was noted in *C. gariepinus*(13.4± 4.4 mg/g) compare than other fishes. At the time low level of protein was observed in *C. punctuatus and O. mossambicus* (10.0 ± 3.8 mg/g). The proximate composition of fish varied from species to species and even within the same species from one individual to another (Stansby, 1962). According to Graves (1970), the body composition of fish seems to depend on age, sex, season and diet.

Carbohydrates are chemically defined as aldehyde or ketone derivatives of higher polyhydric alcohols. Carbohydrates are either simple or complex and are major sources of energy (4.1 Kcal/g) in all human diets. These are the chief sources of energy constituents of compound lipids and conjugated proteins. Degradation products acts as promoters or utilized for synthesis of other substances like fatty and amino acids, constituents of muco - polysaccharides which from the ground substance of mesenchymal tissues. Inherited deficiency of certain enzymes in metabolic pathways or different carbohydrates can cause diseases.

Carbohydrates constitute only a minor percentage of total biochemical composition. Carbohydrates in fishery products contain no dietary fiber but only glucides, the majority of which consist of glycogen (polysacchride). They also contain traces of glucose, fructose, sucrose and other mono and disacharides (Okuzumi and Fujii, 2000). Various factor like gonad development in addition to starvation, feeding, rest, exercise and other physiological states changes the carbohydrate level. In the present study, carbohydrate content was higher in *C. punctuates* (11.6 ±1.15 mg/g). At same time low level of carbohydrate was observed in *C. punctuates* (10.0± 3.8 mg/g). In the same study was conducted in varies fresh water fishes (Ananthi *et a1.*, 2015).

Lipids are transported in blood, in combination with protein, in the form of lipoproteins. The patterns of blood lipids are based on the distribution of fat and cholesterol among different lipoproteins. Lipids are high efficient as a source of energy, and it shows more than twice the energy 0f carbohydrates and proteins (Okuzumi and Fujii, 2000). In the present study, lipid content was high in the fish was *G. giuris* (4.02 1±2.0 2mg/g). and low level was noted in the fish *O. mossambicus* (1.02 ± 0.08 mg/g). Das (2009) reported that afferent species showed lipid level at different condition (Temperature, Freezing time, Location size). Lipid content Rohu (*Labeo rohita*), Grass (*Ctenopharyngodon idella*) and Tilapia (*O. mossambicus*) were 5.12%, 4.61%, and 2.55% respectively in fresh condition. The present study was almost similar to report of Das (2009).

CONCLUSION

The present observation concluded that the taste, Size, Freshness and other related external appearances should not be the only factors to be considered in making choice for marketing the fish and also consumption of these five fishes. It helps to provide the scientific knowledge and information of the proximate composition of five important commercial fishes of Veeranam Lake, Cuddalore district, Tamil Nadu, India.

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