

Variations of Protein Content in Commercially Important Fishes of Southern Arabian Gulf

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Abstract - Estimation of protein content in edible fishes is essential and thus a bio-monitoring study was carried to find out the rich protein content in commercially important available fishes of the coastal Ras Al Khaimah Emirates of the United Arab Emirates. Protein composition in the muscle of six edible fish species were studied. The protein contents were measured to be highest in *Lethrinus nebulosus* 243.7µg/100mg of tissues similarly *Rhabdosargus sarba* 229.9µg/100 mg on the comparative bases of proteins, showed decreasing trends in *Gerres longirostris* 156.0 µg/100 mg, *Carangoides chrysophrys* 151.4 µg/100 mg, *Atule mate* 136.7 µg/100 mg, *Siganus canaliculatus* 97.0 µg/100 mg, respectively. The results emphasize the importance of food value among the fishes of Ras Al Khaimah, United Arab Emirates fish landing site and it alarms the consumer a better awareness about the nutritive value of fishes in selection process of edibility and health concern. Hence, the fishes are highly recommended for consumption, since these fishes are highly enriched with protein. The results can be used as a baseline data for comparing the variations in protein content of fishes in future.

Key Words: Protein, Lowry method, muscles, commercial fishes

1. INTRODUCTION

The advent of blue revolution has become one of the man's great hopes for future food supplies as the human population multiplies and industrialization increases the problem of environmental pollution. Recently world consumption of fish has increased simultaneously because of their nutritional and health benefits. Moreover; fish is an important source of protein, essential minerals, vitamins and unsaturated fatty acids. Additionally, it is a rich source of omega-3 fatty acids [1]. The World Health Organization (WHO) recommends the regular consumption of fish – one to two portions a week [2]. With an average portion size of 150 g, this results in a worldwide recommended annual consumption of 11.7 kg fish per capita. Fish is highly nutritious, tasty and easily digestible. Fish protein can be used therefore to complement the amino acid pattern and improve the overall protein quality of mixed diet [3]. In recent years the nutritional importance of aquatic food has increased substantially because of scientifically recognized beneficial effects of eating aquatic food, fats and oil. Fish protein contributes enormously to the supply of both macro

and micro nutrients in our diet [4]. Scientist reported that societies with high fish intake have considerably lower rates of acute myocardial infarctions & other ischemic heart diseases. The present availability of protein is much below the minimum daily requirements and the livestock sector alone will not be able to meet the protein requirement of ever increasing human population. Fish is an excellent & relatively cheaper protein source of high biological value. Fish are a rich source of protein and have a lower caloric density, compared to land living animals [5]. Strong links between fish consumption and positive health effects, especially with the decreased risk of coronary heart and cardiovascular diseases, decreased inflammatory disease as arthritis and prevention of cancer have been shown by many researchers [6,7,8,9]. Even if this research is still in its beginning, studies related to inflammation, metabolic syndrome, osteoporosis, insulin resistance, obesity-related comorbidity and development of cancer have been executed and fish protein, peptides or hydrolysates have shown of importance in nearly as many areas as fish lipids [10]. Furthermore, fish protein hydrolysates are considered as superior from a nutritional point of view due to the excellent amino acid composition and easily digestible proteins [11,12]. Fish provide about 14% of the world's need for animal proteins and 4% to 5% of the total protein requirement [13].

Fish protein has since long been considered having a high nutritional value [14]. Nonetheless, only in the last decade, research has also focused on the beneficial health effects of fish protein in human nutrition [15]. In addition to the high nutritional value, fish proteins also have good functional properties such as water-holding capacity, gelling, emulsification, the water-holding capacity and the gelling properties which determine the textural attributes of the products are important quality parameters [13]. Proteins are important for growth and development of the body, maintenance and repairing of worn out tissues. Protein content of fish muscle depends on species, nutritional condition and type of muscle. Fish proteins are having high biological value as they contain all essential amino acid in the right proportional and specially, lysine as well as Sulphur containing amino acid such as methionine and cysteine which are absent in plant protein.

As the Arabian Gulf is vastly supplied with a great variety of fish species, local population are highly dependent on fish for

food. However, knowledge concerning the nutritional quality of the commercially important fishes especially from the Arabian Gulf is limited. So, this study was carried out to determine the protein content of six edible fishes, most commonly consumed by the local population of the United Arab Emirates.

2. Materials and Methods

2.1: Sample collection

Six marine commercially important fish species *Gerres longirostris*, *Lethrinus nebulosus*, *Siganus canaliculatus*, *Rhabdosargus sarba*, *Carangoides chrysophrys*, *Atule mate* samples (n=15) were collected from the fish landing site, Ras Al Khaimah Emirates of the UAE. After collection, samples were kept in plastic bags and transported in an insulated icebox to the laboratory and were beheaded, gutted, washed and filleted. Fish muscle tissues were homogenized for chemical analysis. All the samples were analyzed in triplicates.

2.2: Protein Estimation

Protein was estimated following the method of [16]. Freshly weighed (100 mg) tissues of concerned organ were homogenized with 5% trichloroacetic acid in a homogenizer. The homogenate was centrifuged at 3000 rpm for 10 minutes and the residue was dissolved in 0.1N NaOH. Exactly 0.2ml of this solution was made up to 1ml using 0.1N NaOH. To this, 3.5ml of Folin's reagent was added and was thoroughly mixed. After 30 min of rest the optical density was measured at 660 nm in Spectrophotometer-Jenway 7315, Bibby scientific Ltd, UK. Calibration curves were prepared for each assay with a bovine serum albumin (BSA) stock solution (200 mg/mL; Sigma P5369) and using a polynomial line of best fit generated in Microsoft Excel 2010.

3. Results and Discussion

The present investigation deals with protein composition of the muscle of *G. longirostris*, *L. nebulosus*, *S. canaliculatus*, *R. sarba*, *C. chrysophrys*, *A. mate* fishes of Ras Al Khimah, United Arab Emirates. The protein contents were measured to be highest in *L. nebulosus* 243.7 µg/100mg of tissues similarly *R. sarba* 229.9 µg/100 mg of tissue on the comparative bases of proteins, showed decreasing trends in *G. longirostris* 156.0 µg/100 mg, *C. chrysophrys* 151.4 µg/100 mg, *A. mate* 136.7 µg/100 mg, *S. canaliculatus* 97.0 µg/100 mg, respectively. These results showed that the good quantity of protein is present in all six different commercially important species, so they can be safely used in food to supplement of required protein. The variations among the fishes were represented in chart-1. These findings are in line with, the effect of dietary protein levels on fish growth performance varies considerably within species, size, age, diet and composition, range of lipids level tested and rearing conditions [17]. Carnivores fish such as in *Lethrinus sp.* classified them as

bottom-feeding carnivorous fish, they feed on mainly molluscs, crustaceans, sea urchins, hard-shell invertebrates and sometimes fishes [18].

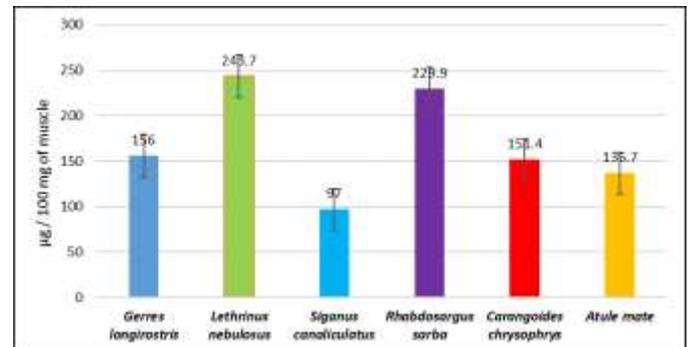


Chart -1: Variation of protein content in muscle tissues of six different fishes, the data is shown as mean ± standard deviation (n=15), total protein content of muscle tissues (µg/100mg of tissue)

The herbivorous fish such as *Siganus sp.* feed on benthic algae and to some extent on seagrass [19]. The protein studies are very important from the nutritional point of view. Protein is vital for the sustenance of life and accordingly exists in the largest quantity of all nutrients as a component of the human body [20]. In various fish species, proteins are of important as structural compounds, biocatalysts and hormones for control of growth and differentiations [21]. Protein in fish is a main component constituent of tissue and organs. They are precursors of other nitrogen compounds (enzymes, hormones, slurry, neurotransmitters, cofactors) and constitute an important energy source. Inadequate protein levels in the diets result in a reduction of growth and loss of weight. However, when an excess of protein is supplied in the diet, only part of it is used for protein synthesis growth and the remaining is transformed into energy [22]. Each body cell is composed mainly of protein. Protein makes up the membrane surrounding the cell and also occurs within the cell. During growth period, adolescence and pregnancy, the number of cell increases and more protein is required for cell growth. In all stages of life tissue protein is constantly being broken down and must be replaced by dietary protein. Protein plays a vital role in the formation of enzymes, antibodies and hormones and other substances that regulate the body process. Fish and shellfish are important source of protein [23]. They are also increasingly marketed for the health benefits to consumers [24]. The requirement of nitrogen and sulphur is regulated by dietary protein. The protein immunoglobins act as prime defense against bacterial and viral infections. Proteins by means of exerting osmotic pressure help in maintenance of electrolyte and water balance in human system. Several studies show that protein derived from fish, balances many body regulatory factors. It is well known that protein is the most important and expensive item that should be supplied in adequate amounts to support good growth with minimal cost [25,26].

3. CONCLUSION

Present study was carried out to find the protein content of six economically valuable fishes. Results showed that these fishes are a source of high quality protein. The estimation of proteins will certainly detect early signs of clinical pathology with respect to their habitat. This study also delivers valuable information on variations in protein content of fish species studied in order to take necessary precaution in processing from manufacturer point of view. Biochemical studies of fish tissue 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. Hence, consumption of these species is highly recommended since these fishes are more nutritious. Further, through this bio-monitoring study, present results of the protein estimation can be used as baseline data for comparisons in future, with regard to fish nutritional quality.

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