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COMPARISON OF NUTRITIONAL AND MICROBIAL QUALITY OF EDIBLE MARINE FISH SARDINELLA LONGICEPS COLLECTED FROM LANDING CENTER AND MARKET

Merline, X., Dr. Chitra, G. and *Dr. Dhanalakshmi, B.

Department of Zoology, Nirmala College for Women, Coimbatore

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ABSTRACT

Nutritional quality of a food is very important. The nutritional importance of seafood has increased substantially because of beneficial effects of eating seafood fats and oils. The present study deals with nutritional and microbial quality of edible marine fish *Sardinella longiceps*. The proximate composition of protein, carbohydrate and lipid content were analysed. The results of proximate analysis showed that landing center sample had higher protein content (22.50%) and carbohydrate content (3.02%) than the market samples. However market sample showed the higher lipid content (1.96%). From the results the market sample had higher pH, moisture and salt content (7.34%, 75.20% and 0.80%) respectively. Landing center sample showed the lowest total bacterial count of 1.0×10^5 cfu/g, which is below the permissible limit of 7×10^5 cfu/g and market sample showed the highest total bacterial count of 76×10^5 cfu/g.

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INTRODUCTION

Fish constitutes a very important component of diet for many people, provides much needed nutrients for a healthy living. It serves as a principal source of dietary protein. Fish are known to contain a very high quality of fats and oils, and its fat is very high in polyunsaturated fatty acids, which are very important in lowering blood cholesterol level. Marine species of fish are highly susceptible to rapid spoilage at ambient temperature. Preservation in ice is one of the most efficient ways of retarding spoilage. The rate of deterioration during ice storage of fish varies with species and depends on the concentration of substrates and metabolites in the tissue, microbial contamination and conditions of storage after catching (Agbo *et al.*, 2002). The microbiological complexity of seafood is link to the specific as well as non-specific microbial contaminants originating from the natural environment or being acquired during processing. The wide range of environmental habitats and the variety of processing practices are all important factors in determining the initial contamination of fish and fish products. The physico chemical factors determine the freshness of the fishes. *Sardinella longiceps* (Sardine) is one of the most important commercial

marine fishes in India popularly consumed in all parts of South India. The Indian oil sardine is one of the more regionally limited species of *Sardinella* and can be found in the northern regions of the Indian Ocean. It is known to be high nutritive value. Immaculate *et al.*, (2012) analysed the biochemical and microbial qualities of *Sardinella fimbriata* sun dried in different methods. Nutritional and microbial quality of fresh and dried *Clarias gariepinus* and *Oreochromis niloticus* was investigated by Oladipo *et al.*, (2013). An effect of drying methods on proximate composition of cat fish (*Clarius gariepinus*) was reported by Ogbonnaya and Shaba (2009). The present study was to determine the rate of physico chemical, biochemical factors influencing the microbial population which in turn affects the freshness and nutritive quality based on collection of fishes from coastal area of Tuticorin landing centre to local wholesale fish market in Coimbatore, TamilNadu.

MATERIALS AND METHODS

Sample collection

Fresh raw sardine (*Sardinella longiceps*), were collected from landing center in Tuticorin, coastal area, Tamil Nadu and from the wholesale local fish market in Ukkadam, Coimbatore, Tamil Nadu.

*Corresponding author: Dr. Dhanalakshmi, B

Department of Zoology, Nirmala College for Women, Coimbatore, India

Sample preparation

The collected samples were immediately placed in an ice box containing crushed ice, kept cold and transported to the laboratory. The samples were beheaded, gutted, washed and filleted. Then the known weights of muscle samples were homogenate and filtered and then used for further analysis.

Parameters Analysed

Various parameters like physico chemical and microbiological parameters were analysed in the samples.

Physico- chemical analysis

Measurement of pH

The sardine samples (10g) were homogenized in sterile blenders with 10ml of distilled water to make thick slurry. The pH of this slurry was then measured using a pH meter (Eco tester pH1), where three reading were recorded and the average was calculated (Ronald and Ronald, 1991).

Table 1. Physicochemical, biochemical and microbial qualities of *Sardinella longiceps*

S.no	Sardine fish Samples	Physico chemical parameters			Biochemical parameters			Microbial count
		pH	Moisture (%)	Salt (gm)	Protein (gm)	Carbohydrate (gm)	Lipid (gm)	TVC@ 37 ^o C
1.	Landing center	6.96	73.03	0.14	22.50	3.02	1.45	1.0×10 ⁵ cfu/g
2	Local market	7.34	75.20	0.80	22.36	0.48	1.96	76×10 ⁵ cfu/g

Estimation of moisture: (Jain and Singh, 2000)

A known quantity of the sample is taken in a weighed fish and the moisture is removed by heating in a hot air oven. Finally it is cooled in desiccators and weighed. The difference between the weight of the sample before and after drying gives the moisture content and it is usually expressed as percentage (1%) of the weight of the sample.

Estimation of salt

The salt content in each sample was determined according to the AOAC (1995) procedures by homogenizing 2 g of sample with 18 ml of distilled water. The homogenate was titrated with 0.1M AgNO₃ using 10% w/v. K₂Cro₄ solution used as an indicator.

Biochemical analysis

The total protein content of fish was estimated by following the method of Lowry *et al.* (1951). The total carbohydrate content of the fish was estimated by following the method of Hedge and Hofreiter (1962). Total lipid was determined by the method described by Floch *et al.* (1957).

Total viable count

One gram (1g) of fish sample was dissolved in sterile deionized water and serially diluted. One millilitre (1ml) of appropriate dilutions was seeded on plate count agar using spread plate method, and the medium was then incubated at 37^o C for 24 hours. The plate count agar was examined and colonies present were counted and recorded after incubation at 37^o C for 24 hours to get the total colony count in cfu g⁻¹.

RESULTS AND DISCUSSION

Fishes used for the study were the best quality fishes purchased from the landing center and market. The results of physico chemical and microbiological analysis of the fresh fish of landing center and local market were shown in Table - 1. P^H is an important factor that affects the microbial growth and spoilage of foods. The pH value of market sample showed highest pH value of 7.34 then the sample collected from landing centre (6.96). The increase in pH value of the market sample may be due to the storage leading to the autolytic changes by the microbial population. This result was in agreement with Mannar and Farag (2013) revealed that there was increase in pH values of marketed sardine during storage. The moisture content of the samples from landing centre and market were found to be 73.03% and 75.20% respectively. The moisture content indicating that the percentage of moisture in sardine muscle tissues was in acceptable level (70-80%), which may be due to the stable levels in the environmental locations, where the fish was collected.

The fish samples collected both from landing centre and market showed protein contents of 22.50gm and 22.36 gm respectively. The carbohydrate content was relatively low when compared to protein content of the samples. From the results recorded carbohydrate content in fresh sardines of landing centre and market were 3.02 gm and 0.48 gm. A good source of instant energy that comes to the mind is the carbohydrates. It also helps in the body development and growth. The carbohydrate content in the fish is generally very low and practically considered zero (Osibiona *et al.*, 2006). This coincides with the result obtained in this work indicating that the sample collected from the market are poor source of carbohydrate. The relatively low values of carbohydrate could be due to higher values of moisture.

Lipid content of the sample collected from the landing centre and market were found to be 1.45 gm and 1.96 gm respectively. Lipids are soluble in ether hence they are ether extractable. They serve as source of energy during starvation and fasting. The lipid content of examined sample collected from landing centre was relatively low compared to the market sample. High protein is desirable for a growing child and low lipid is equally desirable as to reduce oxidation and rancidity in the fish products which causes off- flavour and bad taste in fish products (Oparaku *et al.*, 2013). According to Ackman (1989), generally fish can be grouped into four categories according to their fat content lean fish, low fat (2-4%), medium fat (4-8%) and high fat. In the present study the selected species of *Sardinella longiceps* are low fat content (2-4%). The total viable count expressed as colony forming unit in one gram of sample (cfu/g) of the representative sample was determined by standard plat count method on plate count agar media. The total viable count of fresh sardine sample collected from

landing centre showed 1.0×10^5 cfu/g and the market sample showed 76×10^5 cfu/g which is far exceed than the permissible limit of Food and Drug Administration (7×10^5 cfu/g).

Conclusion

This study gives a clear perspective on the variation of physico chemical and bacterial content of the sample collected from landing center (Tuticorin) and local market (Coimbatore). The study revealed that fish sold at the local markets had microbial count above the local and the international permissible standard limit. To overcome this situation, it is necessary to follow the code of practice concerning handling of the catch, icing, post-harvesting procedures and storage including depuration and hygienic measures, proper hygienic condition should be maintained at every step of catching, landing and transportation.

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