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Microbiological and Biochemical studies on salt processed food fish sea bass, *Lates calcarifer* from Machilipatnam coast, Andhra Pradesh, India

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ABSTRACT

Fish is a good source of animal protein and omega 3 fatty acids. Fish and fisheries consumption is increased in the world from past few decades due to recognition of their high nutritional value. Fish proteins are rich in lysine and threonine thus, effectively supplementing cereal proteins. With increasing demand for fresh fish, the condition under which it is harvested and brought to the landing centre and marketed needs to receive greater attention. In less developed area, due to lack of adequate refrigeration and transportation facilities in most of the seasonal fish landings are sold in the local markets and the rest are salted or dried by traditional methods. Particularly in salt processed fishes microbial and biological quality assessment is necessary to ensure the food safety of any processed product. In this study, an experiment carried out to assess the changes in microbiological and biochemical characteristics of salted *Lates calcarifer*.

KEYWORDS Microbiological, Biochemical, salted *Lates calcarifer*

Introduction

Fish and fishery products play an important role in the human nutrition. According to nutritionists, fish is an excellent substitute for red meat and also good source of protein. Fish flesh contains all the essential amino acids and minerals viz. potassium, iron, copper, phosphorus, iodine, vitamin A and D in desirable concentrations. There is huge demand for fresh and processed fish in the developed and developing countries due to its nutritional value. Fish, in particularly fatty fish is attracting great attention because of good source of the long chain n-3 polyunsaturated fatty acid (PUFA's), primarily docosahexaenoic acid (c22:6n:3) and eicosapentaenoic acid (c20:5n:3). The PUFAs have been claimed for their positive role on human health. They play an important role in the prevention of cardiovascular disease (Sinclair, 1993; Stone, 1977) and may decrease the development of cancer (Terry et al., 2001). This sector is expected to become the major supplier of sea food to global populations. It has been predicted that this consumption in developing countries will increased by 57% from 62.7 million tons in 1997 to 98.6 million tons in 2020 (Delgado et al., 2003)

Rapid population growth, urbanization and increasing of industrial pollutants into aquatic ecosystem are leading major changes in supply and demand of fish. Furthermore, India is not only the second largest producer of fish but also third largest consumer of fish per capita consumption is low (8kg), when compare with many developing countries. Growing population and increased demand for fish and positive shift towards animal protein are the additional strength of domestic market. The increase in domestic per capita income of an average Indian has made the fish affordable. The recent development of super market chains with separate section of fresh fish indicates the domestic market potential for fish like *L. calcarifer*, popularly known as sea bass which is distributed in the tropical and the subtropical coastal waters of Indo-Pacific (Bensam and Nammalwar, 1991).

The fish contains polyunsaturated fatty acid (PUFA) enriched of omega-3 fatty acid, that play an important role in cardiovascular system of human beings to reduce the risk of heart attack (Islam,1983) and helpful to decrease cholesterol levels in blood and helpful in the prevention of hyper lipidemia, secondarily high blood pressure for mankind. The nature and quantity of lipid in fish are dependent on species and their feeding habits. Fish lipids and fatty acids play a significant role in membrane biochemistry and have direct effect on the membrane mediated process in human such as osmoregulation, nutrient assimilation and transport (Ibrahim, et al., 2004). Fish is a perishable food and consumers can be cooked fresh but are not always easy to get hold.

So that, the traditional methods like salting and drying are practiced by the fisher from ancient period to minimizing fresh fish losses. The traditional seafood preservation methods are effective in controlling microbial activity from the point of safety, but have adverse organoleptic and textual properties. The current demand for natural foods necessitates new approaches to sea food preservation. So far practicing traditional methods have evolved empirically from chance discoveries and were established by early civilization. In India, the processing techniques have not much changed much, in spite of enormous research towards improving quality. Obviously, the greatest advantages of traditional fish processing method in India are that, they suit the food habit**s** of the local people and are convenient to produce both in small and large scale, low cost in nature, easy to store and use. The objective of this study is to produce low cost processed product based on traditional technologies, which can be stored at ambient temperature. In the present study an attempt has been made to produce the salt processed *L. calcarifer*.

Materials and methods:

Sample collection:

Salt processed Sea bass *Lates calcarifer* collected form Nizampatnam harbor was used for the present study. The biochemical analysis like the moisture, total protein, crude fat and ash content was estimated by the method AOAC (1995). For microbiological analysis enumeration of total viable counts of bacteria were determined by the dilution plate method of APHA, (1976) using trypton agar medium (p^H: 7.0). Dilution and incubation was carried out in aseptic condition in a laminar air flow chamber and the plates were incubated at 37± 2° C in BOD incubate for 48 hours.

Results and Discussion:

The proximate composition of the processed product was analyzed immediately after preparation and on the last sampling day of the storage study and also the biochemical and microbiological load given in Table 1 and Table 2 respectively. The pretreatment of fish with salt was done by dry salting. In the coastal area of due to lack of adequate refrigerator and immediate transport facility from most of the fish landing centers are sold in the local market and rest of the fish may salted/ dried or both types may processed in traditional methods. The preservation of traditional cured products is mainly attributed to decrease in moisture content and increased salt content resulting in reduced water activity. In the present study the salt content of the product was comparatively lower and it was less than 5% .The decrease in the popularity of salt cured products is mainly due to their high salt content, which is chiefly considered as a factor leading to hypertension. The increase of protein was due to dehydration of water molecule present between the proteins causing aggregation of proteins which result in the increase the protein content of some levels of salt dried fish. The similar results observed by Ninawe and Rathnakumar (2008). Cowey and Sargent (1947) stated that the reduced moisture content and increased protein content. Crude fat content were less in salt dried samples than the fresh fish and then variation could be results of evaporation of moisture content with lipids. The fat content may be reduced with evaporation of moisture and increase during the salt processed. Clucas and Ward (1996) reported that inorganic contents remain as ash after the organic matter is removed by incineration. The ash content also decreased in salt processed fish compare with fresh fish and the results are also in accordance with the earlier findings of Tunison et al.,(1990); Ojitiku et al.,(2009).

The spoilage in processed with salt fish during storage is mainly due to the activity of microorganisms the salt tolerant bacteria. The microbiological analysis of fish *L. calcarifer*, clearly indicate that the activity of bacteria during the storage period, in spite of their reduced moisture activity. The initial TPC of *L. calcarifer* in fresh fish goes to 2.6 (cfu/mg10^6) and salt processed at the end of 4th week it goes to 1.8 (cfu/mg10^6). *E. coli* and *S. aureas* goes to negative results at the end of 4th week storage. The initial increase of total plate count during storage is due to the high water activity. Lupin et al., (1981) have established a relation between moisture content and microbial activity. The preservation of traditional cured products is mainly attributed to decrease in moisture content and increased salt content resulting in reduced water activity. In the present study salt content of the product was less than 5% and the product does not have much salt content and is near to the human threshold values of 3.0% (Amerine et al., 1965). The increase in salt content during storage is marginal. International commission of microbiological standards of foods (ICMSF, 1988) recommended that fish products having a total bacterial count in excess of 10^7 should be considered as unacceptable. In the present study microbiological characteristics of the total count of the processed fish material was under acceptable limits.

Table 1. Changes in the Biochemical composition of salt processed *Lates calcarifer*

S.No.	Characteristics	Fresh	1st week	2nd week	3rd week	4th week
1	Moisture	74.6	73.2	73.0	73.7	73.9
2	Total protein	35.2	36.6	36.8	36.6	35.8
3	Crude fat	10.3	9.2	9.5	9.4	9.6
4	Ash content	3.4	3.0	2.9	2.8	2.5

Table 2. Changes in the microbiological characteristics of salt processed *Lates calcarifer*

S. No.	Bacteria	Fresh	1st week	2nd week	3rd week	4th week
1	TPC (cfu/mg 10^6)	2.6	2.9	3.2	1.6	1.8
2	*E. coli* (cfu/mg10^6)	3.5	2.6	2.0	-ve	-ve
3	*S. aures* (cfu/mg 10^6)	2.3	1.9	1.2	1.0	-ve

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