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RESEARCH ARTICLE

Microbiological and biochemical observations of *Lates calcarifer* in different types of processing with Hurdle technology

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Abstract

Fishes are excellent sources of high quality protein and low in fat. Fish proteins are also rich in lysine and threonine thus effectively supplementing source of energy for human beings. Fish though high in its nutritional source alongside has sometimes disadvantages that include contamination and spoilage at various stages of handling and processing. Fishes processed by different types of preservative methods like icing, salting and smoking etc., but in these methods due to some reasons quality is deterioration and the spoilage of fish takes place it directly effect on the human health. In this context, it is necessary to check the quality of differently processed fish by using hurdle technology. Hurdle technology usually works by combining more than one approach. These approaches can be thought of as "hurdles" the pathogen has to overcome if it is to remain active in different types of processed food. In the present study observe the microbiological and biochemical status of different types of processed fish *Lates calcarifer* with the hurdle technology.

INTRODUCTION

Fish are the most numerous of vertebrate, with at least 20,000 known species, and more than 58% are found in marine environment (Thurman and Webber, 1984). These are the admirable sources of high quality protein and low level unsaturated fats. Fish in its nutritive value it become highly perishable commodities and public always required continuous reassurance about its quality. Global consumption of fish and fish products are increased in recent years due to recognition of their nutritional value (Wang *et al*., 2010). *Lates calcarifer*, an economically important food fish is of table size and has a body shape amenable for easy portioning with minimum wastage. It contains polyunsaturated fatty acids (PUFA) enriched with omega-3 fatty acid, which play important roles in cardiovascular system of human beings to reduce the risk of heart attack. Fish quality is influenced by many factors such as the source, processing, packing and storage conditions. The quality and freshness of fish are rapidly deteriorated through microbial and biochemical mechanism (Al-Jasser and Al-Jasass, 2014). Due to its high nutritional source it has some disadvantages which include contamination and processing. Fish is the most susceptible to autolysis, oxidation and hydrolysis of fat and microbial spoilage. Rate of fish spoilage is mainly owing to nature, season, catching methods, acquired micro flora, atmospheric temperature etc. The quality of a fish is a major concern to food processor and public health authorities. Hence proper preservation of fresh fish becomes very important.

The Food and Agriculture Organization (FAO, 1973) asserted that fish contributes about 60% of the world's supply of protein and that 60% of the developing world derives more than 30% of their annual protein from fish. This implies that any shortfall in fish availability will effect the animal protein intake of people in different countries along with this for fish preserving, sorting and transporting inefficient and insufficient infrastructure available that causes wastages of thousands tons of even well accepted types of fishes. Many countries now have comprehensive system of inspection and control of at least some aspects of fish quality. For this purpose it is

important to assess the quantity of processed fish by hurdle technology. Hurdle technology involves applications of several processing/preservation methods in small amounts that individually are insufficient for preservation, but when combined are sufficient to preserve the food for reasonably long periods. In developing countries, application of intelligent hurdle technology has proven useful for novel foods. The hurdles that are of eliminated or rendered harmless in the final product. Salting, smoking, cooling and freezing are widely used methods for preservation of fish. Cooling could not prevent spoilage but shelf-life could be prolonged through decrease of body temperature. During the cold or freezer storage period biochemical changes in lipids and proteins are reported by Latip et al., (2013). The main objective of this study is to observe the microbiological and biochemical observations of differently processed *L. calcarifer* with Hurdle technology.

Materials and Methods

Fish for the study was collected from Nizampatnam harbor and brought to the laboratory without contamination. These fishes were processed by different types of preservative methods like icing (at 4ºC), salting (250 grams salt per 1 Kg body weight of fish), and smoking fishes are taken for the present study. For microbiological analysis enumeration of Total Plate Counts (TPC) of bacteria were determined by using potato dextrose agar by APHA, (1992). *Salmonella* sp. was determined using Salmonella and Shigella Agar (SSA) (37±1°C, 72 hrs). *Staphylococcus aureus* was determined by using Tryptone Soy Broth (37±1°C, 72 hrs), Potato dextrose agar was used for counting mold and yeast (22±1°C, 5 days). All colonies were counted and data was determined. For biochemical analysis the proximate composition i.e. ash and moisture of differently processed fish samples were evaluated using the standard AOAC procedure (AOAC, 1995). The protein content was determined using the Lowry et al., (1951), crude fat content was determined using Folch et al., (1957).

Results and Discursions

The complex concept of fish quality consists of safety, nutritional value, availability, eating quality and product size. The most serious problem related to this product safety is the contamination with microbial pathogens. Further, fish products are highly sensitive to spoilage because, of their high content of protein, fat, moisture content and naturally present autolysis enzymes. Iced, salted and smoked are fish preservation methods in the study area. The percentage of proximate composition of raw and different types of processed (Iced, salted, smoked) *L. calcarifer* were given in Table No: 1 and microbial observations given in Table No: 2. The proximate composition of the processed products was analyzed immediately after the preparation and on the last sampling day of the storage study. The proximate composition of processed fish shows that the moisture content was little bit high level and total protein content was low levels recorded during present study. Crude fat also decreased in processed fish. In case ash content the fresh fish goes 2.4% and processed fish recorded little bit high levels. Similar results observed by Sirikar et al., (2013). Cardinal et al., (2001) stated that relatively and significant increase occurred in ash content of smoked fish samples during storage. The crude fat and ash contents increased due to water loss during the processed fish (Bhuiyan et al., 1986; Unlusayin and Gulyavuz, 2000). The proximate composition of processed fish proteins also decreased compare with fresh fish. Shirikar et al., (2010a, 2010b) also concluded that total proteins decreased in the processed fish. But, Gandotra et al., (2015) reported that the protein, lipid, moisture and ash content decreased during the entire storage period in both the samples *Cyprinus carpio*.

The result of microbial analysis reveal that the total plate count was observed in fresh fish and smoking fish where as icing and salting fish goes negative results. Johnson et al., (1994) stated that freezing and cold storage are efficient methods of fresh preservation but they do not improve the product quality. It is necessary to preserve the fish at 0°C after catch as its spoilage is very rapid (FAO, 1973). Survival of the spoilage microorganisms during storage depends on the types of microorganisms and fish species, history of the fish, methods of catch and the handling and storage processes (Ashie et al., 1996). Sodium chloride has shown the ability to inactivate autolytic enzymes in marine species. Reddi et al., (1972) reported that NaCl is an inactivator of catheptic activity, which may also control autolytic spoilage. Obemeata et al., (2011) reported that the significant increase in bacteria load when fish was subjected to frozen storage at -18°C than at 4°C. They stated that the freezing of fish at -18°C created unfavorable environmental conditions for the growth and survival of microorganisms.

The present study reveals that different processed fish have a significant role in the proximate composition and microbial quality of *L. calcarifer*. It was observed that hygienically processed fish had comparatively good nutritional value and low levels of microbial count. The salt processed fish will help the poor fisher folks and getting better price for their products but also enhance the consumer preference in the local market. In case of poor coastal people are not able to affort to the refrigerator, it also advisable to adopt and practice fish salting and smoking methods for alternative methods.

Table No: 1. Biochemical observations of fresh and processed *L. calcarifer*.

S.No.	Biochemical Composition %	Fresh	Iced	Salted	Smoked
1	Total protein	35.4	34.2	34.0	33.2
2	Crude fat	10.5	10.2	10.1	10.9
3	Ash content	2.4	2.9	2.8	3.1
4	Moisture	75.4	76.4	76.2	77.2

Table No: 2. Microbial loads in fresh and processed *L. calcarifer*.

S.No.	Microbial loads	Fresh	Iced	Salted	Smoked
1	TPC(cfu/mg 10^6)	5.3	-ve	-ve	3.8
2	*Salmonella*(cfu/mg10^6)	6.4	-ve	-ve	4.3
3	*E.coli* (cfu/mg 10^6)	5.8	-ve	-ve	3.8
4	*Staphylococcus*(cfu/mg 10^6)	6.8	-ve	-ve	4.3

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