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Qualitative changes of low value fishes, lizard fishes during various processing treatments

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ABSTRACT

The qualitative changes of different processing treatments viz., freezing, smoking, drying with respect to the fresh fish on the chemical and sensory qualities of lizard fish (Saurida tumbil) were investigated. The moisture content varied narrowly between 74% - 75.6% in fresh and frozen samples. But, in the samples of smoked and dried the moisture is ranged from 19.67 % to 21.22% respectively. The protein content, crude fat and ash showed wide variation ranging between 15.3% to 20.7%, 0.45% to 5.86% and 1.9% to 27.31% respectively. The biochemical parameters like TMA, TVB-N, PV and FFAwas ranged between 6 to 14.4 mgN/100 g,31.8 mg /100g to36.9 mg /100g, 1.7 to 2.2 milliequivalent of O_2/kg of fat and0.38 to 0.48 % of oleic acid respectively. The total plate count (TPC) was ranged from 4.1 x 10^3cfu/g to 3.5x 10^5cfu/g. The pathogenic bacteria like Vibrio cholera, Salmonella spp., Staphylococcus aureus and Listeria monocytogenes were absent in all the samples. Therefore the present study shows that the chemical parameters are in below the range of acceptable limit and fit for utilization of these low value fishes for consumption, fish meal etc.

Key words: Trash fishes; processing treatments; proximate composition; Qualitative changes

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INTRODUCTION

As the world population is growing tremendously, and the per capita consumption of seafood is also increasing swiftly. For the sake of health consciousness, the modern day man is interested in taking seafood more in view of its nutritional superiority than all other sources of food accessible to him [1].Fish is a rich source ofpolyunsaturated fatty acids (PUFAs), namely, the omega-3 andomega-6 PUFAs, and it has been recognized as an excellent food source to human health[2]. For many centuries, it is preferred as aperfect diet not only due to its excellent taste and highdigestibility but also because of having higherproportions of unique fatty acid profile, essential aminoacids and minerals for the formation of functional and structural proteins [3].Fish is considered to be one of the most important sources of animal protein available in the tropics and has been widely accepted as a source of high quality protein and other elements for the maintenance of healthy body [4].Fish meat is also a rich source of minerals and the most abundant micro-elements are Zinc (Zn), Iron (Fe) and Copper (Cu) [5]. These minerals are generally higher in marine fish than in fresh water fish [6].

It is essential to know about the proximate composition in order to estimate their energy value. In general, the proximate composition of fresh fish is 60 to 80% water, 15 to 30 % protein, and 1 to 10% fat [7]. However, the biochemical composition of fish flesh may vary within same species depending upon the area, age, season and sex of the individual [1]. There remains no considerable study on selective marine low value fishes with regard to their nutritive value. Though the marine fishes are being consumed andin India there is no evidence to support the low value fishes as edible. Hence, the present work was planned to study the proximate composition and qualitative of

low value/ trash fishes (lizard fishes) occurring along the coast of kerala for estimating their major proximate components such as total protein, carbohydrate, lipid, moisture and ashcontent.

MATERIALS AND METHODS

Samples: In the present study, Lizard fishes (*Saurida tumbil*) with an average size ranging from 25-30 cm were collected from fish landing centre, Ernakulum, Kerala. The collected samples were kept in ice in the ratio of 1:1 and transported to the laboratory in polystyrene boxes to sustain freshness. After reaching the laboratory, the samples were thoroughly washed and rinsed with de-ionized water to remove the adhering contaminants and then drained.

The fish samples were divided into four lots to examine the effect of different processing treatments such as fresh, freezing, smoking and drying on the qualitative and quantitative analysis.The first lot was treated as control (raw). The other lots were subjected to different processing treatments. All the experiments were conducted in triplicates. The second lot, third lot and fourth lot were subjected to freezing, smoking and drying process respectively.

Proximate analysis

The Moisture content was determined by the standard AOAC method [8] for which a known weight (10 ± 0.5 g) of sample was placed individually in a moisture dish and dried in an hot air oven (Technico, Chennai, India.) was set at 105˚C for 18 h.Crude protein content was calculated by multiplying the nitrogen content determined by the Kjeldahl's method by 6.25. Crude fat content was determined by the method described by the AOAC [8] using the Soxhlet extraction system(Pelican Equipments, Chennai, India). Ash content was determined based on the standard AOAC method [8] at 550°C ± 10°Cfor 12 to 15 h and the difference between the initial and the final weight gave the crude ash content.

Biochemical Indices

The total lipid was estimated by the method of Bligh and Dyer [9]. The sodium chloride was estimated by Volhard's method. The total volatile bases nitrogen (TVB-N) and trimethylaminenitrogen (TMA-N) was determined by the method of Beatty and Gibbons [10]. The alpha amino nitrogen (AAN) content was estimated by the method. Peroxide value (PV) and free fatty acids (FFA) were determined according to Jacobs [11] and Takagi [12] respectively using chloroform-methanol extract of lipids, respectively.

Microbial and Sensory Analysis

The microbiological analysis for aerobic plate count (APC),*Salmonella spp.*, *Vibrio spp.*, *Staphylococcus aureus* and *Listeria monocytogenes*were done using standard methods [13]. The acceptability of the products was assessed using 10-point hedonicrating through trained panel. The results of sensory analysis were statisticallycompared with the qualitative characteristics using correlation coefficient[14].

Statistical analyses

The IBM SPSS (V 20.00 for windows, SPSS Inc., Chicago, IL, USA) statistical package was used for analysis of the experimental results.

RESULTS AND DISCUSSION

The lizard fishes are small sized pelagic fish measuring usually less than 29 cm. The total length was ranged between 26–29 cm, and the weight was varied between 800-900 gm. The proximate composition of the fish products were shown in Table 1 andthe moisture content varied narrowly between 74% - 75.6% in fresh and frozen samples. But, in the samples of smoked and dried the moisture is ranged from 19.67 % to 21.22% respectively. The protein contentshowed wide variation ranging between 15.3–20.7%. The crude lipid content was 1.29 in fresh; 0.45 in frozen; 5.71 in smoked and 5.86 in dried fish products. The ash content was 2.5 in fresh; 1.9 in frozen; 5.09 in smoked and 27.31 in dried samples. The results of the proximate composition compares well with those obtained by Gopakumar (1997). Jitesh [16] have analysed the proximate composition oflizardfish (*Saurida tumbil*). They have reported that the moisture content is 78.43 %; protein content is 17.15%; total lipids content is 1.89% and ash content is 1.59%. It is also well known that the reduction in moisture content of fish and fishery products during frozen storage because of dehydration [17]. Moisture slowly leaves the product with the increasing period of storage. Such minor decrease in moisture content may be attributed to cell damage caused by the ice crystals formed during freezing [18]. In smoking and drying methods, the moisture is removed either by dehydration or evaporation process. Thereby reducing the availability of water activity and increasing the shelf life of the products.The slight difference in the values may be attributed due to the seasonal and size variation of the fish selected. Proximate composition of fish differs with species, sex, body, size, season, environmental factors, nutritional status and even on the type of muscle sample [17].

Table 1: Proximate composition of samples

Sl. No.	Sample	Moisture (%)	Protein (%)	Fat (%)	Ash (%)
1	Fresh	76.87± 0.02	19.34 ± 0.10	1.29 ± 0.05	1.83 ± 0.10
2	Frozen	71.37 ± 0.58	25.81 ± 0.23	0.449 ± 0.30	1.9 ± 0.09
3	Smoked	19.67 ± 0.69	69.53 ± 0.27	5.71 ± 0.18	5.09 ± 0.13
4	Dried	21.22 ± 1.44	45.61 ± 0.32	5.86 ± 0.08	27.31 ± 0.19

Note: Values are shown as mean ±standard error of triplicates.

The biochemical characteristics of the present study samples was having TVB-N was ranged between 33.6 mg /100gin fresh fish, 36.9 mg /100g in frozen,34.5mg /100g in smoked, and 31.8 mg /100g in dried condition respectively. The recommended values of TVBN ranging from 35-40 mg/100g for a good quality fish and the value from 50-70 mg/100g is considered as the upper limit beyond that the fish is not considered for edible[19]. However, according to Mathew [20] a TVBN value of 35-40 mg/100g of muscle is usually regarded as the limit of acceptability beyond which the fish can be considered as spoiled. The TMAcontent was 6mgN/100 gin fresh fish, 11.6 mgN/100 g in frozen condition fish, 12.8mgN/100 gin smoked and 14.4mgN/100 gin dried fish samples. Methylamine compounds, particularly trimethylamine oxide (TMAO), are compatible osmolytes that commonly occur in tissues of marine organisms [21]. The present results were within the acceptable limit of 15 mgN/100 g [22].The PV in fresh fish 2.2, frozen 2.1, smoked 1.9 and dried 1.7 for milliequivalent of O_2/kg of fat. In fresh fish, the FFA represented 0.48% of oleic acid in fresh, whereas 0.42 in frozen,0.38 in smoked and 0.31 in dried products respectively. In fresh mackerel and pink perch, PV values of 4.62 and 3.69 milli moles of O_2/kg fat respectively have been reported [23]. The PV value should be much below 10 milli moles O_2/kg fat and the above 20 milli moles of O_2/kg fat is considered to be rancid smell[19]. Mathew [20] have described the PV values above the level of 10-20 milli moles of O_2/kg fat to impart rancid smell and taste in all probability. The present results suggest that the fish are in good condition throughout the storage period based on values of 10-20 meq/kg of oil as recommended by Connell [24].

The total plate count (TPC) ranged3.5x 10^5cfu/g in fresh,4.1 x 10^3cfu/g in frozen 3.7-7.5x 10^3cfu/g in smoked and 4.8x 10^4cfu/g in dried products.*V. cholera, Salmonella* spp., *Staphylococcus aureus* and *L. monocytogenes* were absent in all the samples. With regard to the organoleptic quality, the overall acceptability of fish as represented on a 10-point hedonic scale showed a value of 7.5, 8.3 and8.6 for each of the three batches respectively. Total plate count (TPC) as determined by serial dilution agar plating technique were found to be 8.18 x 10^5 colony forming units (CFU) per gram of meat. Similar observations have been made during iced storage of common murrel [25] and tilapia fishes [28]. The microorganisms present in a fishery product may be 'natural' present in gut, gills, skin, etc. or 'incidental' which enter into the product during post-harvest processing [27].

CONCLUSION

The present study shows that the chemical parameters are in below the range of acceptable limit. The observations clearly demonstrate that the low commercial value of fishes will be considered for human consumption.

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