STUDIES ON THE SHELF LIFE AND NUTRITIVE VALUES OF TWO COMMERCIALLY IMPORTANT MARINE FISH SPECIES DURING ICED STORAGE, BOILED & FRIED CONDITIONS

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Abstract*: Several experiments were carried out to ascertain the nutritive value of two locally available marine fish (Pampus argenteus known Pomfret and Lates calcarifer known as Coral) on their different physical condition. Organoleptic, chemical and biochemical parameters were used to evaluate the influence of iced storage, boiled and fried on the samples. Three days ice stored raw materials exhibited excellent quality on the basis of physical characteristics. Moisture content of Pomfret (Pampus argenteus) and Coral (Lates calcarifer) were increased with the storage time and ranged from 57.72% to 72.59 % and 56.65% to 73.43% respectively. Protein content increased and the values ranged from 12.85 to 23.47% and 13.67 to 24.76% respectively for the two fish samples in boiled and fried condition. With the progress in storage period lipid content decreased in boiled condition but gradually increased in fried condition and ranged from 14.59 to 19.95% and 14.66 to 19.77% respectively for samples. Ash content increased in boiled and fried condition and the values ranged from 1.23% to 3.76% in Coral and 1.96% to 2.33% in Pomfret. The Total Volatile Base Nitrogen (TVB-N) values of the two samples increased slightly, for Pomfret (Pampus argenteus) the TVB-N value ranged from 7.54 to 11 mg/100g; for Coral (Lates calcarifer) it ranged 7.5 to 12.5 mg/100g.*

Keywords: *Marine fish species, nutritive value, storage period, boiled and fry condition.*

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Introduction

High quality protein with essential amino acids and fats with polyunsaturated fatty acids that plays an array of significant roles in health benefits including keeping our brain and heart healthy can be largely found in fish[1.]

Ice storage, boiled, & fried marine fish are usually used as high biological value protein and as a substitute of fish at the less availability of fresh fish because these are the fastest and simplest methods of fish cooking. Fishes are processed for mass consumption because fresh fish supply cannot meet the demand in Bangladesh. It is also a very favourite food item among Bangladeshi people and has a good market demand besides fish and seafood products[2]. Since boiling and frying involves high temperature, nutrients degraded through oxidation and hydrolysis of the fatty acids[3]. After hydrolysis and oxidation of fatty acids of fish in frying, the breakdown products can give rise to good flavour and taste. Fish is highly consumed all over the world for its nutritional value and taste.

Fish cannot be replaced by any animal source protein in the diet of millions in Bangladesh[4]. Supplementation in infants and adults diet can be done by the fish or fish product as these are very rich sources of essential nutrients[3]. Protein, lipid, and other nutrients comprises the nutrient composition of fish[5-7].

The objective of this study is to determine the shelf life and nutrient values for two marine ice-storage, boiled, & fried fishes; Pomfret (*Pampus argenteus*), Coral (*Lates calcarifer*) in Bangladesh. A number of study on proximate composition of different marine fishes were found in the literature[8-10]. However, in the context of ice-storage, boiled, & fried fish, few studies has been done in explaining the proximate composition of marine fishes. As. The concern of the researcher is to explore the shelf life and nutrient values of ice-storage, boiled, & fried fishes with the increasing of storage period.

Materials and method

Two commercially important marine fish species were included in this investigation, the fish species were Pomfret (*Pampus argenteus*), Coral (*Lates calcarifer*). Fresh Pomfret (*Pampus argenteus*) and Coral (*Lates calcarifer*) were bought from Kawran Bazar, Dhaka. These fishes were caught from the Bay of Bengal and channeled to Kawran Bazar. The iced fishes were put into a deep freeze for freezing. After the completion of freezing, the fishes were packed in an insulated box. Organoleptic evaluation had been carried out using Sensory methods. Details of the processes and steps carried out have been described in the following sections.

Sample Preparation

Collection of the fishes

Two different sizes fresh but iced Pomfret (Pampus argenteus), Coral (Lates calcarifer) fish had been collected from Kawran Bazar, Dhaka the early hours of the day.

Handling of experimental fishes in laboratory

Being iced fish, fishes were transported to the research laboratory in iced condition using ice-basket. Ice-basket helped to keep the fish in our collection condition and avoid any type of microbial contamination.

Preparation of fishes

Fishes were carefully washed with cooled tap water. Scales, fins, gills and viscera were removed and again washed with tap water to remove blood, slime and unnecessary flesh.

Proximate Composition

The percentage of proximate composition of fish was determined by conventional method of Association of Official Analytical Chemists (AOAC) [11].

Determination of Moisture content

Moisture content was determined in triplicate by placing an accurately weighed amount (about 7—8 g ground sample in a pre-weighed porcelain crucible in a hot air oven (Gallenkamp, HOTBOX, Model OVB-305) at 105° C for 24 h until a constant weight was obtained.

Determination of Ash content

Ash content of the sample was determined by igniting sample about 4-5g in a Muffle Furnace (Philip Harris Ltd, England), for 6 hours at a temperature of 550° — 800° C. After cooling, the crucible was weighed again.

Determination of Crude protein content

Micro Kjeldahl method was used to determine protein content of the fish samples[11]. It involves the conversion of organic nitrogen to ammonium sulphate by digestion of fish flesh with concentrated sulphuric acid in a micro kjeldahl flask. The data were taken by doing duplicate analyses for protein.

Determination of Crude lipid content

Lipid content was determined by soxhlet apparatus using acetone as solvent. Prepared sample was weighed (within approximately 3-5g sample was taken) and then taken in a paper thimble and placed it inside the Soxhlet apparatus[11].

Determination of Total Volatile Base-Nitrogen (TVB-N)

For chemical evaluation of shelf-life TVB-N test was used. Total Volatile Base Nitrogen (TVB-N) was determined according to the methods given in AOAC (1980)[11] with certain modification.

Determination of pH

pH was measured using a pH meter (Corning Model 250) after homogenizing 2g of fish muscles with 10 ml distilled water in a blender.

Result & Discussion

Organoleptic assessment

The results of the organoleptic quality assessment of Pomfret (*Pampus argenteus*) and Coral (*Lates calcarifer*) during ice storage are presented in table 1. The qualities of the fishes were graded using the score from 1 to 5 according to grade scoring method. The total number of defects or demerit points were used in defining the grades. Score points less than 2 was considered as excellent. Score points from 2 to less than 5 were judged as good or acceptable conditions, while 5 and above considered as bad or rejected.

Table 1. Changes in physical characteristics Pomfret (*Pampus argenteus*) and Coral (*Lates calcarifer*) **during ice storage**

Days of ice storage	Organoleptic quality	Point	Overall Quality
0	Natural fishy odor; bright red gill; full bloom, bright and Shining; transparent eye cap; firm and elastic flesh	1.25 - 1.52	Excellent
1	Natural fishy odor; bright red gill; full bloom, bright, Shining; transparent eye cap; firm and elastic flesh.	1.57 - 1.71	Excellent
3	Natural fishy odor; red gill, bright and Shining; transparent eye cap; elastic flesh.	1.71 - 1.86	Excellent
5	Natural odor; slightly pinkish gill; bright and Shining appearance; slightly plane eye	2.01 - 2.33	Acceptable
7	Moderate sour odor; pink gill; slightly dullness and loss of bloom; slightly cloudy lens and sunken eye cap; some softening of flesh.	2.85 - 3.14	Acceptable

Proximate composition of Pomfret (*Pampus argenteus*) and Coral (*Lates calcarifer*) are given figure 1 and figure 2.

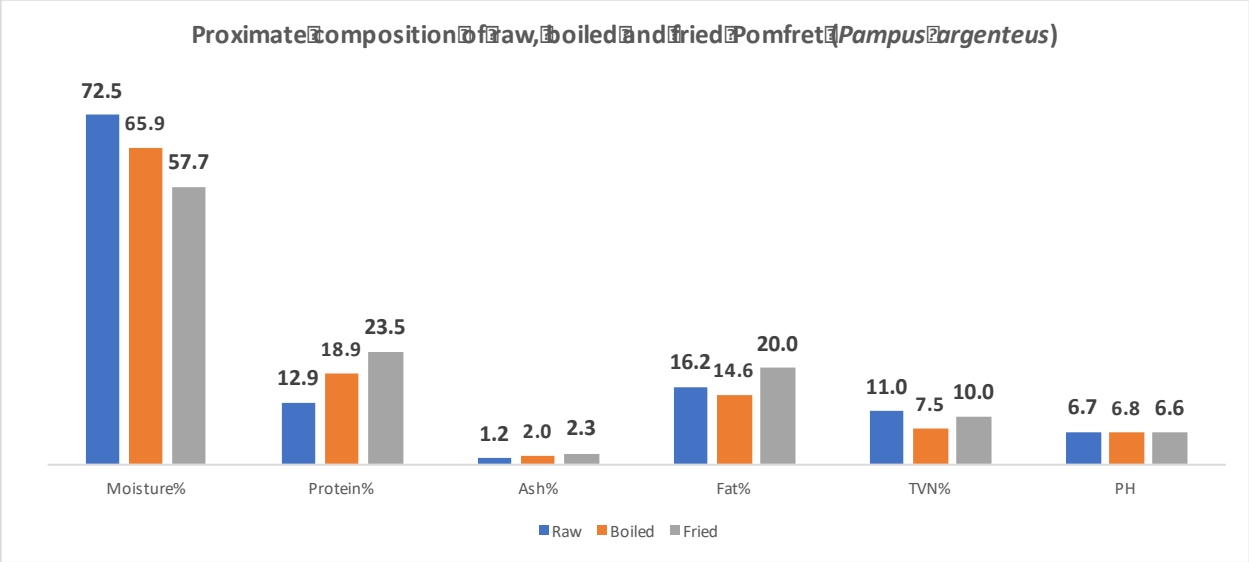

Figure 1. The changes in proximate composition, TVBN and pH of raw, boiled and fried Pomfret (*Pampus argenteus*).

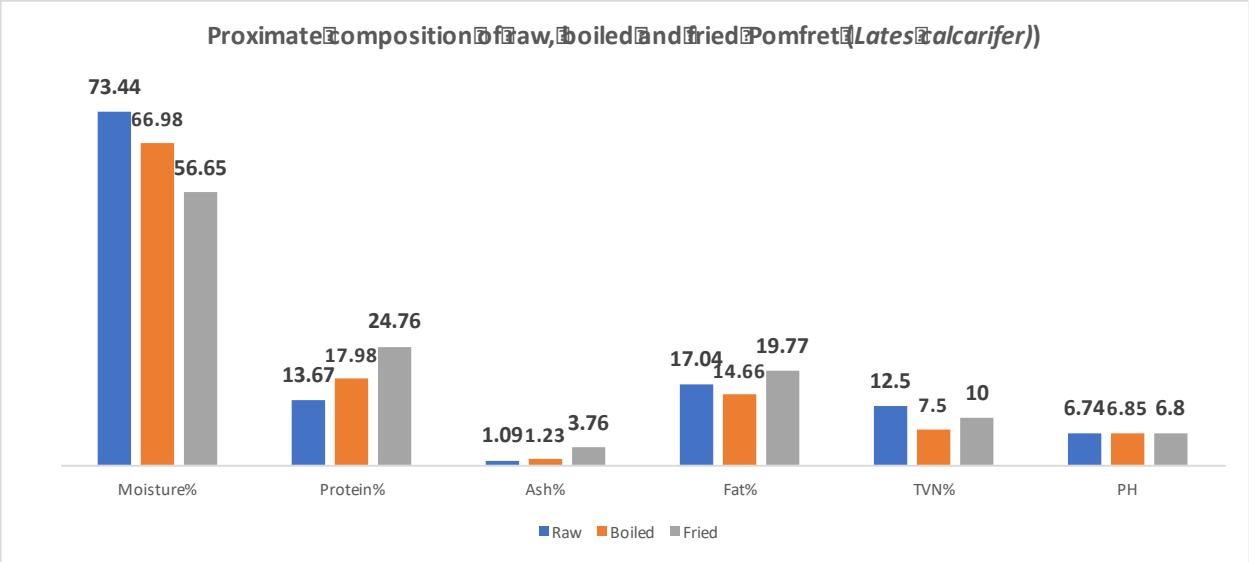

Figure 2. The changes in proximate composition, TVBN and pH of raw, boiled and fried Coral (*Lates calcarifer*).

The moisture content decreased significantly from raw condition to boiled and fried condition in both species of fish. Similar results have been found in boiled rainbow trout fillets[12]. Some researchers disagree our findings with the findings found in three generally consumed fish in Nigeria[13]. It has been seen that moisture content usually decreased in all forms of cooking except for the boiled fillets of striped snakehead fish[14].

The percentage of protein shows a subsequent increase from 12-25% in raw fish to fried fish in both fishes. A higher percentage of protein was found in fried fish (23.5% in *Pampus argenteus* and 24.76% in *Lates calcarifer*). Reduction in moisture content might cause this. Almost similar result was also found in boiled rainbow trout fillets[12].

In present study, the percentage of fat was less in boiled condition than raw condition. But the percentage of fat increased slightly in fried condition in both species of fish. Similar results were found in commonly consumed three types of fishes in Nigeria[13].

In this study, fresh and boiled samples had relatively similar ash composition. Similarly, ash composition did not change significantly in marine fish samples after boiling[13].

The pH value was almost similar in every cooking condition in both marine fish species.

The value for Total Volatile Based- Nitrogen (TVB-N) for shelf life was found 11, 7.5 and 10 in *Pampus argenteus* and 12.5, 7.5 and 10 in *Lates calcarifer*. These findings did not match with the findings found in the study microbiological changes during aerobic iced storage of sea salmon[15].

Conclusion

From the organoleptic perspective the color of Pomfret and Coral were slightly silver to whitish color, which exhibit excellent color for the good fish quality throughout the study period. The results of proximate analysis of the sample fish is within significant range. Considering human health condition finally it can be recommended that these two fish species can be stored in ice for 7 days. In ice storage these three fishes keep in acceptable condition up to 9 days without any prominent deterioration of the quality or loss in the nutrients.

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