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ASSESSMENT OF SHELF LIFE AND QUALITY ASPECT OF MARKET SALTED AND LABORATORY PREPARED SALTED HILSA *(Tenualosa ilisha)*

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ABSTRACT

This study was conducted to compare different qualities of laboratory prepared salted hilsa and salted hilsa from different markets of Bangladesh. There were five treatment namely T_1 = Fresh hilsa, T_2=Laboratory prepared salted hilsa, T_3 = Salted hilsa from Boro Bazar, Rajshahi, T_4 = Salted hilsa from Mechoya bazar, Mymensingh, and T_5= Salted hilsa from Kewatkhali, Mymensingh.All samples were evaluated by studying proximate composition, TVBN value, salt concentration and total microbial load. Moisture, crude protein, crude lipid and ash content of fresh hilsa were 60.98%, 19.92%, 17.51% and 1.18% respectively while moisture, crude protein, crude lipid and ash content of laboratory salted hilsa were 42.92%,25.55%,21.23% and 10.21% respectively. Moisture was significantly higher in fresh hilsa than salted hilsa and the crude protein, crude lipid and ash were significantly higher in salted hilsa than fresh hilsa due to dehydration of salted hilsa. TVB-N content of fresh, laboratory prepared, Rajshahi market, Mechoya bazar and Kewatkhali market sated hilsa were 2.26, 3.74, 4.65, 5.04 and 5.29 mg/100g respectively which showed the best quality product was laboratory prepared salted hilsa. Similarly, salt content of fresh, laboratory prepared, Rajshahi market, Mechoya bazar and Kewatkhali market sated hilsa were 10.26, 15.61, 23.65, 25.04, and 28.31 % respectively which resulted excess salt content of market samples. The total Bacterial Load (CFU/g) of fresh, laboratory prepared, Rajshahi market, Mechoya bazar and Kewatkhali market sated hilsa were 1.75×10^6, 2.37×10^2, 1.83×10^4, 3.26×10^4, and 2.55×105, respectively.

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INTRODUCTION

Bangladesh is an agro based country enriched with enormous fisheries resources. Fish is very important food stuff in developing countries due to its high protein content and nutritional value. Fish provides more than 50% of the animal protein for the populations of 34 countries (Bhuiyan, 1987). Among the fishes hilsa is rich in protein, fat, vitamins and minerals. It is considered as the national fish due to its popularity, economic importance and historically securing the largest share of landing with approximately 354.8 metric tons annually combined from island and marine capture (Department of fisheries, FRSS Report, 2015). Hilsa, the national fish of Bangladesh has been playing a very important role in our economy. In fishes, proximate composition means the composition of the fish flesh. Fish flesh contains four basic ingredients in varying proportions major nutrients such as water (70-80%), protein (18-20%), fat (5%) and minerals (5%) and minor nutrients such as vitamin, carbohydrate. It has high nutritional value in terms of fats and proteins that are not commonly available in other foods. Food quality of market salted hilsa varies with salting procedure and other factors. Fish quality is all those attributes which fish eater or buyer consciously or unconsciously consider or expect to be present in fish in terms of nutritional benefit, dietary satisfaction and that it does not contain any harmful bacteria or pathogen and that it is caught from unpolluted water (Mansur, 2012).

In our country the catch of hilsa is available more or less round the year, but the catch is very high during the monsoon (i.e. June to October) with peak harvest in September (FRI, 1991). During this period a large quantity of hilsa fishes are caught which amounts about 90% of total catch. The main landing centres of hilsa fish are located at Chandpur, Cox's Bazar, Chittagong, Barisal and Khulana. Large amount of hilsa spoils each year due to inadequate preservation facilities. Fish preservation has been practiced in Bangladesh for a long time; the simplest methods employed are drying, salting, freezing and semi-fermentation. Drying is not suitable for hilsa, because hilsa contains high amount of fat, which causes more oxidation and rancidity. Fatty fishes are less suitable for long term freezing, because most of pelagic fatty species contain large proportion of dark muscle which leads to muscle protein deterioration more quickly than lean fishes during freezing and frozen storage. Some of the hilsa are frozen. A few are smoked but, although available before, are not found in the market now (Nowsad, 2007). High lipid content makes the hilsa very susceptible to oxidative rancidity, along with rapid autolytic and bacteriological decomposition (Nowsad, 2010). So, adequate handling and immediate icing for the fish are required. Salting is the oldest and effective method of fish preservation which provides the following advantages. Salting is a simple and low cost fish preservation technique; It does not require any equipment or machinery; it can be done anywhere; Salt is easily available and salting can be done throughout the year, especially during monsoon when other low-cost preservation like sun-drying is not possible; It keeps the fish edible for a long time compared to other preservation methods. The following objectives were set for in this study; to know the nutritional value of laboratory prepared hilsa and market salted hilsa, to know the microbial load of laboratory prepared hilsa and market salted hilsa, to compare the nutritional and microbial composition of laboratory prepared hilsa and market salted hilsa, to determine the salt content and shelf life of laboratory prepared and market salted hilsa.

MATERIALS AND METHODS

The study was conducted during January 2018 to June 2018 and was carried out in the Laboratory of Processing and Microbiology, Fisheries Microbiology Lab., Fish Processing and Quality Control Lab., Fish Harvesting Lab and Post-Graduate Lab., Department of Fisheries Technology,Bangladesh Agricultural University.

Collection of Sample

The hilsa fish was collected from Kamal Ronjit Market, Mymensingh and the salted hilsa was collected from Kewatkhali bazar, Mymensingh, Mechoya Bazar, Mymensingh, Boro Bazar, Rajshahi, respectively.

Preparation of salted hilsa

The raw fishes were eviscerated, cleaned, washed, weighed and cut the fish into chunk and finally prepared for salting. The raw fishes were enrolled by dry salt (fish: salt = 4: 1), stacked in straw mat and stored for a salting or curing period, at room temperature. Then the extracted water of the fishes due to salt action was removed from the mat. Thus the fishes were always allowed to remain in dry condition for the production of dry salt cured fish.

Bio-chemical analysis

AOAC (1980) method was followed for bio-chemical analysis of the *T. ilisha*homogeneity of the samples was done by using a blender.

Moisture was determined by placing an accurately weighed known amount of ground sample in a pre-weighted porcelain crucible in an electric oven at 105^0C for 24 hours until constant weight was obtained. The loss of moisture was calculated as percent moisture.

$$\text{Moisture content (\%)} = \frac{(\text{Weight of wet material} - \text{Weight of dry material})}{\text{Weight of wet material}} \times 100$$

About 3-5g prepared sample was taken in pre-weighed porcelain crucible and was placed in muffle furnace at 550^0c for 6 hours. Then the crucibles were cooled in desiccators. The average in percentage of each sample of the remaining materials was taken as ash.

$$\text{Ash content (\%)} = \frac{\text{Weight of ash}}{\text{Weight of sample}} \times 100$$

Crude protein content was determined by AOAC (1980) methods. Total nitrogen was calculated by using the following formula-

$$\text{Nitrogen (\%)} = \frac{(\text{ml of Acid titrated x normality of acid titrated x milli equivalent of N } 0.014)}{\text{Weight of sample}} \times 100$$

% of crude protein: Nitrogen% x 6.25

Prepared fish sample was weighed and taken in a paper thimble and placed it insidethesoxhlet apparatus to determine the crude lipid content of the prepared sample. Lipid content was calculated by using following formula-

TVB-N content of the sample can be calculated by the following formula-

$$\text{TVB-N (mg/ 100 g sample)} = \frac{\text{ml of titrant required} \times 0.014 \times \text{Normality of titrant}}{\text{Weight of sample (gm)}} \times 100$$

Determination of Salt Content

In this determination, 1.0g fish sample was taken from ground fish sample in a conical flask and was mixed with 10 ml distilled water, was stirring and mixed for half an hour so that all the salt in the muscle becomes soluble in water. Then the solution was filtered with filter paper and an aliquot of 0.2 ml from the solution (filtered) was taken in another conical flask to which 10 ml of distilled water was added followed by an addition of 2 drops of 5% Potassium Chromate and mixed properly. Titration was done with 0.05 N $AgNO_3$ solutions up to the end point which was indicated by the brick-red color.

Salt content of the samples was determined by the following formula:

$S_1 \times V_1 = S_2 \times V_2$

Where,

V_1= Volume of sample

V_2= Volume of titrant

S_1= Strength of sample (NaCl)

S_2= Strength of titrant ($AgNO_3$)

% of NaCl = $S_1 \times 58.5$ (molecular wt. of NaCl)

Microbial analysis

Total bacterial count of fresh and salted hilsa samples was done by Standard Plate Count (SPC) method. Standard plate count expressed as Colony Forming Units per gram (CFU/g) of the samples were determined by using consecutive decimal dilution technique using spread plates. Only plates having 30 to 300 colonies were considered for counting in order to get acceptable values. No. of bacteria per gram of the fish sample (CFU/g) was calculated by using the following formula:

$$\text{CFU/g} = \frac{\text{No. of colonies on petridish} \times 10 \times \text{dilution factor} \times \text{wt. of total sample solution}}{\text{Weight of fish sample (g)}} \times 100$$

RESULTS AND DISCUSSIONS

Moisture, crude protein, crude lipid and ash content of raw hilsa were 60.98%, 19.92%. 17.51% and 1.18% respectively (Figure 1). Kaisar, 2014 found that the moisture, crude protein , crude lipid and ash content of raw hilsa was 56.816%, 18.709%,18.932% and 1.266% which are more or less similar with the present study. The moisture, crude protein, crude lipid and ash content of raw hilsa was 65.735, 18.55%, 14.44% and 0.81 (Dewan, 2010) which are also similar with the current research work. Moisture, crude protein, crude lipid and ash content of laboratory salted hilsa were 42.92%, 25.55%, 21.23% and 10.21%, respectively (Figure: 2-7). Moisture, crude protein, crude lipid and ash content of Salted Hilsa, collected from Boro Bazar, Rajshahi were 45.38%, 22.56%, 17.73% and 14.23% respectively. Moisture, crude protein, crude lipid and ash content of Salted Hilsa, collected from Mechoya Bazar, Mymensingh were 45.73%,21.91%,17.39% and 14.91% respectively (Figure: 2-7). Moisture, crude protein, crude lipid and ash content of Salted Hilsa, collected from Kewatkhali Bazar, Mymensingh were 47.82%,21.35%,16.24% and 15.32% respectively (Figure: 2-7). Chakraborty *et al.* (1997) reported that moisture content of dry salted, wet salted and sundried salted fish showed significant decreases from an initial 71.80% to 37.06%, 44.90% and 25.95% respectively. Shamim *et al*. (2011) studied the proximate composition of different portion of hilsa collected from two regions of the Bay of Bengal and found the highest protein content (21.89%) in ventral where lowest (20.50%) in caudal region. In this study, we found highest protein content (23.62 ± 0.28%) in dorsal region of fresh sample and lowest (20.79 ± 0.17%) in dorsal region of salted fish. Kaisar, 2014 showed that the moisture, crude protein, crude lipid and ash content of salted hilsa collected from Chadpur was 47.236%, 24.232%, 17.264% and 15.795% which are more or less similar with the present study. Results showed a premium quality of salted hilsa found laboratory prepared product. It can be concluded a best quality of salted produced found from laboratory due to use of best quality ingredient and appropriate method.

Table 1. Proximate composition of fresh and salted Hilsa

Sample	Moisture (%)	Crude protein (%)	Crude lipid (%)	Ash (%)
Fresh Hilsa	60.98±.431	19.92±.380	17.51±.096	1.18±.237
Lab prepared salted Hilsa	42.92±.498	25.55±.576	21.23±.403	10.21±.738
Salted Hilsa,Boro bazar, Rajshahi	45.38±.920	22.56±.498	17.73±.605	14.23±.316
Salted Hilsa, Mechoya Bazar, Mymensingh	45.73±.506	21.91±416	17.39±.710	14.91±.863
Salted Hilsa, Kewatkhali bazar, Mymensingh	47.82±.720	21.35±.225	16.24±.445	15.32±.317

*Values are mean± SD of 3 individual measurements

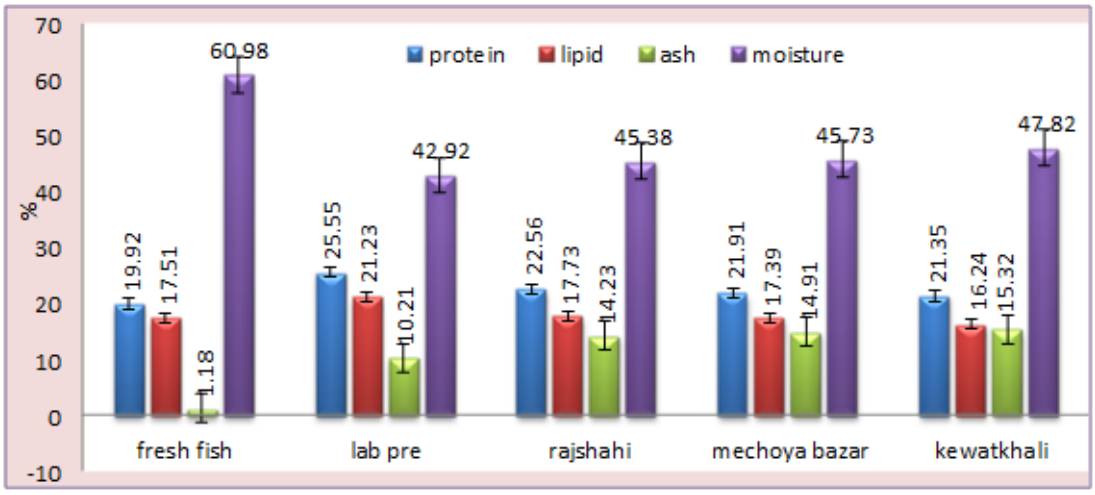

Figure 1. Proximate composition of fresh hilsa and laboratory prepared salted hilsa, salted hilsa from Rajshahi, Mymensingh mechoya bazar, Kewatkhali bazar.

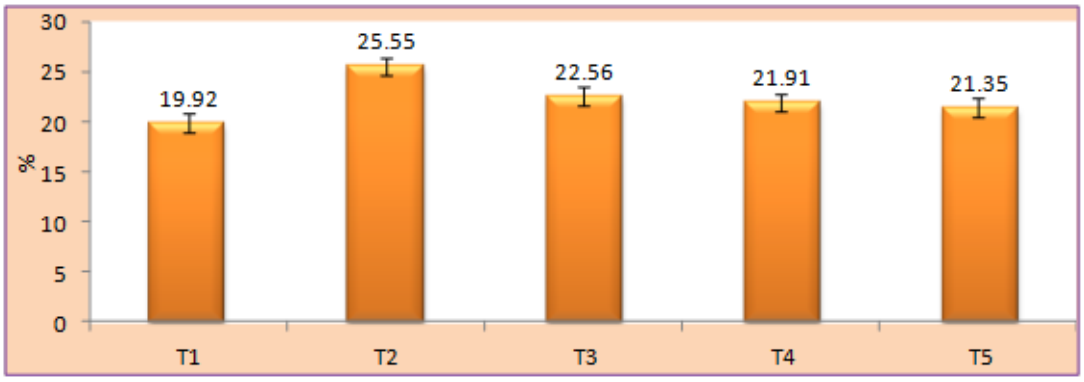

Figure 2. Comparison among protein content of fresh, laboratory prepared and market salted hilsa (*Tenualosa ilisha*). T_1 = Fresh hilsa, T_2=Laboratory prepared salted hilsa, T_3 = Salted hilsa from Boro Bazar, Rajshahi, T_4 = Salted hilsa from Mechoya bazar, Mymensingh, and T_5= Salted hilsa from Kewatkhali, Mymensingh

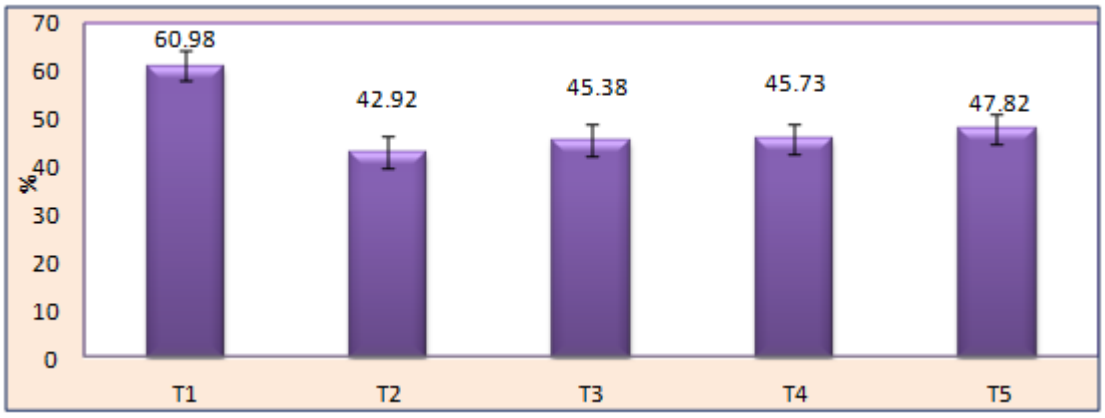

Figure 3. Comparative values of moisture content of fresh, laboratory prepared and market salted hilsa(*Tenualosa ilisha*) T_1 = Fresh hilsa, T_2=Laboratory prepared salted hilsa, T_3 = Salted hilsa from Boro Bazar, Rajshahi, T_4 = Salted hilsa from Mechoya bazar, Mymensingh, and T_5= Salted hilsa from Kewatkhali, Mymensingh

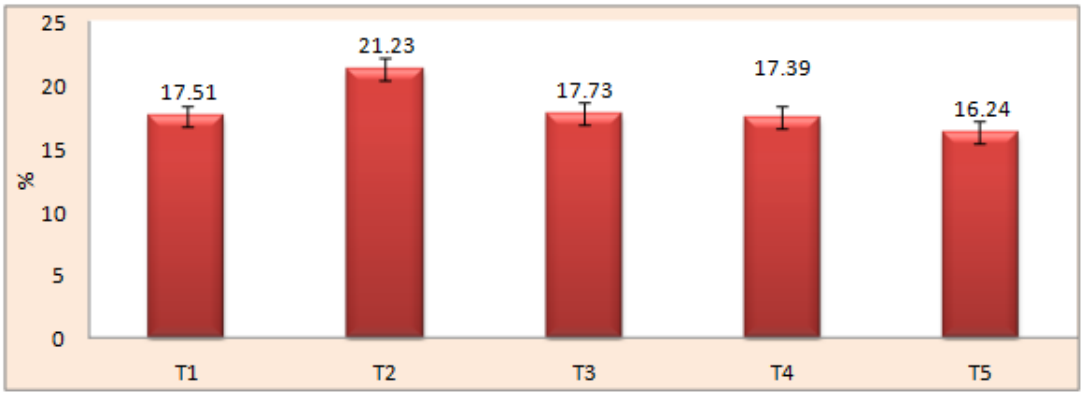

Figure 4. Comparison among lipid content of fresh,laboratory prepared and market salted hilsa(*Tenualosa ilisha*). T_1 = Fresh hilsa, T_2=Laboratory prepared salted hilsa, T_3 = Salted hilsa from Boro Bazar, Rajshahi, T_4 = Salted hilsa from Mechoya bazar, Mymensingh, and T_5= Salted hilsa from Kewatkhali, Mymensingh

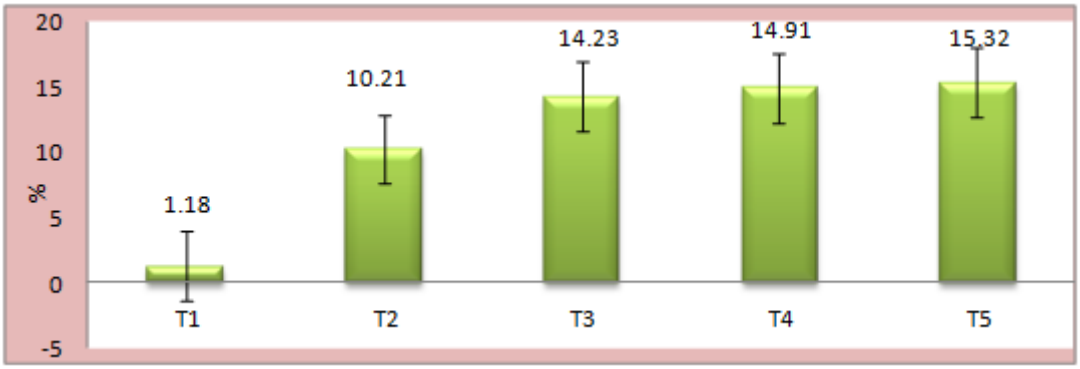

Figure 5. Comparison among ash content of fresh, laboratory prepared and market salted hilsa (*Tenualosa ilisha*). T_1 = Fresh hilsa, T_2=Laboratory prepared salted hilsa, T_3 = Salted hilsa from Boro Bazar, Rajshahi, T_4 = Salted hilsa from Mechoya bazar, Mymensingh, and T_5= Salted hilsa from Kewatkhali, Mymensingh

TVB-N value of fresh, laboratory prepared and salted Hilsa

Qualitative analysis of fresh and salted Hilsa of different samples collected from local fish market of Mymensingh and Rajshahihas been done on the basis of TVBN value and the results are presented in Table 1. TVBN value of fresh hilsa was 10.26mg/100g.on the other hand, TVBN value of laboratory prepared, Rajshahi Market, Mechoya bazar and Kewatkhali market sated hilsa were 15.61,23.65,25.04and 28.31 mg/100g, respectively. Kaisar, 2014 was found that the TVB-N value of raw and salted hilsa collected from Chadpur was 0.886 and 2.847 mg/100g which are more or less similar with the current study. Connell (1995) the upper limit of TVB-N is 30 mg/100g for fin fish dried products acceptability. However, the findings of this study shows that's the TVB-N content obtained from our dry fishes are very close with the previous studies.

The result of fresh and salted hilsa is shown in following table.Salt content of fresh hilsa was 1.52%. Similarly salt content of laboratory prepared, Rajshahi market, Mechoya bazar and Kewatkhali market sated hilsa were 2.95%, 5.57%, 6.07%, and 6.98% respectively. Levanidor (1958) reported that during salting of herring, the loss of soluble substances in the brine was only 0.5% of the initial weight of the fish. Mansur et al. (1998) found that the initial protein content of ordinary salt and pure salt processed hilsa were 16.42% and 16.23% respectively and the final protein Content were 26.58% and 26.87% respectively on 16th day of observation.

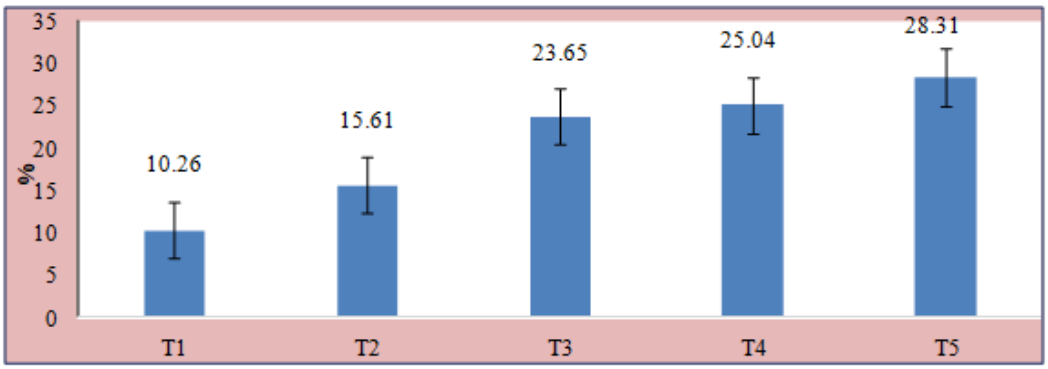

Figure 6. TVB-N content of fresh, laboratory prepared and market salted hilsa (*Tenualosa ilisha*). Salt content of fresh, laboratory prepared and salted Hilsa. T_1 = Fresh hilsa, T_2=Laboratory prepared salted hilsa, T_3 = Salted hilsa from Boro Bazar, Rajshahi, T_4 = Salted hilsa from Mechoya bazar, Mymensingh, and T_5= Salted hilsa from Kewatkhali, Mymensingh.

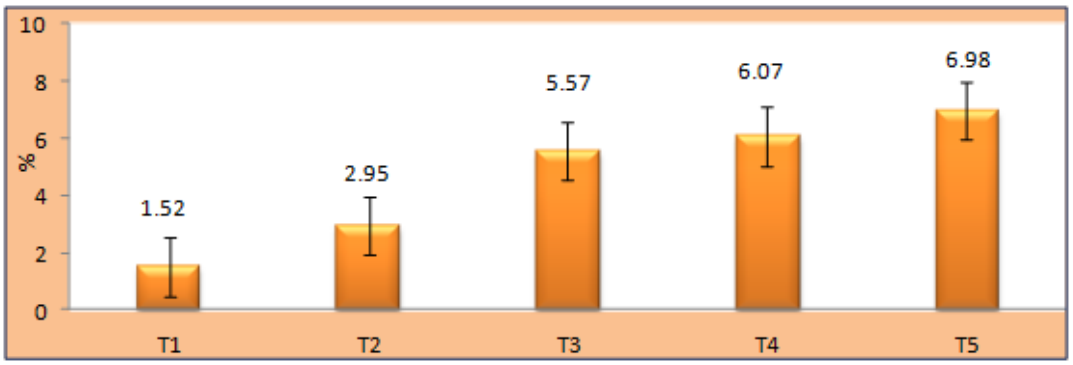

Figure 7. Comparison among salt content of fresh, laboratory prepared and market salted hilsa (*Tenualosa ilisha*), T_1 = Fresh hilsa, T_2=Laboratory prepared salted hilsa, T_3 = Salted hilsa from Boro Bazar, Rajshahi, T_4 = Salted hilsa from Mechoya bazar, Mymensingh, and T_5= Salted hilsa from Kewatkhali, Mymensingh.

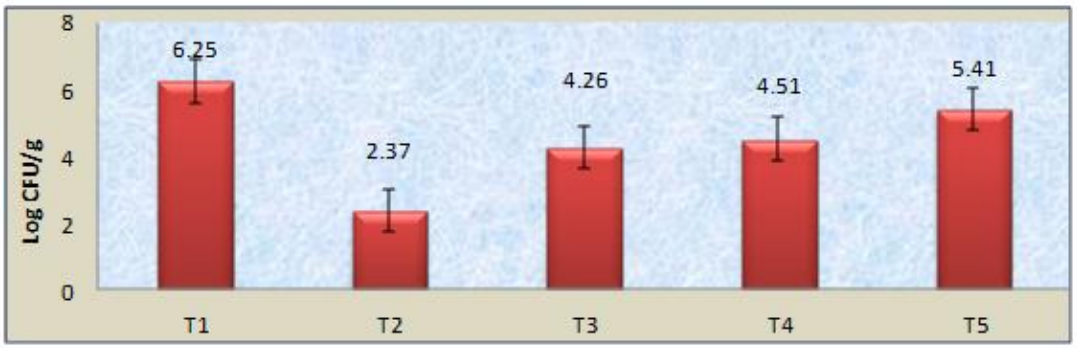

Figure 8. Comparison among Total Bacterial Load (CFU/g) of fresh laboratory prepared and market salted hilsa (*Tenualosa ilisha*). T_1 = Fresh hilsa, T_2=Laboratory prepared salted hilsa, T_3 = Salted hilsa from Boro Bazar, Rajshahi, T_4 = Salted hilsa from Mechoya bazar, Mymensingh, and T_5= Salted hilsa from Kewatkhali, Mymensingh.

Total bacterial load of fresh, laboratory prepared and salted Hilsa

The result of total Bacterial Load (CFU/g) of fresh, laboratory prepared and market salted hilsa (*Tenualosailisha*) is shown in following table. Total Bacterial load of fresh hilsa was 1.75×10^6 .Similarly total Bacterial load of laboratory prepared;Rajshahi market, Mechoya bazar and kewatkhali market sated hilsa were 2.37×10^2, 1.83×10^4, 3.26×10^4, and 2.55×10^5 respectively. Hatha *et al*. (1998) the total bacterial load in raw fish was beyond the acceptable limit (5×105 cfu/g) according to the ICMFS except for raw hilsa of New market (ICMFS) which might be due to secondary contamination during the time of handling as well as storage of fishes in ice made from contaminated water. High microbial abundance might be due to contaminated source of water, poor hygiene and sanitation condition of processing. Shewan(1970) the processed food is considered as spoiled when the total bacterial count (TBC) values reach to 106 cfu/g or more in food items.

CONCLUSIONS

The present study showed the biochemical and microbiological quality of salted fish products prepared from hilsa (*Tenualosailisha*), it also provides a possible application of salt as an efficient method of hilsa fish preservation especially in developing countries like Bangladesh where all the required sophisticated storage equipment is not available. It was observed that the use of salt enriched the flavor with good texture in the product. The results of biochemical and microbiological analysis proved that the overall quality of salted product prepared in the laboratory was better than those salted products collected from markets.

COMPETING INTEREST

The authors declare no competing interests.

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REFERENCES

1. Bhuiyan AK, 1984. Bacterial analysis of different stages of shrimp processing with special reference to quality control, M Sc thesis, Institute of Marine Sciences, University of Chittagong, Bangladesh, 10-28.
2. Chakrabarty SC, Islam MN, Khan AS, 1997. Study on the evaluation of the quality aspects of dry salted, wet salted and sun dried Hilsa fish (*Hilsailisha*). Bangladesh Journal of Agricultural Science, 24: 71-79.
3. Chakrabarty SC, Uddin MB, Islam MN, 2003. A study on the composition of common freshwater fishes of Bangladesh. Bangladesh Journal of Fisheries, 26: 23-26.
4. Connell JJ, 1995. Control of Fish Quality. Fourth edition published 1995 by Fishing News Books, a division of Blackwell Scientific Ltd, 97.
5. Department of Fisheries, FRSS REPORT, 2015. 15-25.
6. DoF, 2013. National Fish Week 2013 compendium (In Bengali), Department of Fisheries, Ministry of Fisheries and Livestock, Bangladesh, 101-130.
7. Fisher W, Bianchi G 1984: Marine Resources Service Fishery Resources and Environment Division FAO Fisheries Department Rome, Italy, 9-13.

8. FRI (Fisheries Research Institute), 1991. In a Report on Hilsa Fishery Development and Management. Fisheries Research Institute (FRI). Riverine Station, Chandpur.
9. Hatha AAM, Paul N,Rao B, 1998. Bacteriological quality of quick frozen (IQF) raw and cooked ready to eat shrimp products from farm raised black tiger shrimp (*Penaeus monodon)*. Food Microbiology, 15: 177-183.
10. Levanidor IP 1958. Quantitative characteristics of fish after salting. Proceedings of the All-union Scientific Institute of Maritime Fishing Economy and oceanography, 35, 46. Translated as selected Articles from Technology of Fish Processing, 39 National Science Foundation, Washington, D. C., 1960.
11. Mansur MA, 2012. Quality control of fish and fishery products In: Fisheries studies part-II Lima printing press, Mymensingh, 202.
12. Mansur MA, Sayed MA, Chakraborty SC, Uddin MN, Khan MNA, 1998. Influence of spawning on the sensory, biochemical and bacteriological characters of dry salted hilsa (*Hilsailisha*) fish at ambient temperature. Bangladesh Journal of Fisheries, 21: 65-72.
13. Nowsad AKMA, 2007. Participatory Training of Trainers: A New Approach Applied In the fish processing. Bangladesh Fisheries Research Forum, 213.
14. Nowsad AKMA, 2010. Post-harvest Loss Reduction in Fisheries in Bangladesh: A way Forward to Food Security. Final Report. NFPCSP-FAO, PR#5/08 project. Food and Agriculture Organization of the United Nations, Dhaka, 162.
15. Shamim MAH, Ahmed MK and Abdullah ATM, 2011. Proximate composition of different portion of hilsa, *Tenualosailisha* from two regions of the Bay of Bengal in Bangladesh. Dhaka University Journal of Biological Science, 20: 109-115.
16. Shewan JM 1970. *Bacteriological Standards for Fish and Fishery Products*, Academic press. New York, 193.