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A COMPARATIVE STUDY ON FRESHNESS OF FISH AT LANDING CENTRE AND IN MARKET OF A PERI-URBAN AREA OF CENTRAL NORTH REGION OF BANGLADESH

M. A. Mansur, S. C. Chakraborty, N. T. Narejo*, M. M. Haque, M. I. Hossain, F. H. Shikha, M. S. Kabir**

Department of Fisheries Technology, Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh.

Abstract

The study was carried out to compare the freshness of fisher folk's catch in the landing centre and in the market of a peri-urban area named Puliamari under Mymensingh district in the central north part of Bangladesh. The fish were collected from the landing centre and from the fish market where the fisher folk usually sell their catch. Freshness tests in terms of sensory, biochemical and bacteriological assessment were performed. Almost all the results obtained from the assessment, it was revealed that the fisher folk's catch is of excellent grade at the landing centre which remains so even after transportation to the market. In the samples from landing centre and that of market the average grade of fish is < 2 which means excellent. The non protein nitrogen (NPN) value of the samples from landing centre and market ranged between 0.04-0.07% and 0.05-0.07 % respectively. Total volatile Base Nitrogen (TVB-N) remained below 10% in all the fish samples. Bacterial count remained in the usual range recommended for very fresh fish. Coliform, pathogens and spoilage bacteria were not detectable in this study. The cause may be that the water is reasonably clean and unpolluted, the fisher folk keep their catch in very good condition in the boat, fishing hour is reasonably shorter and marketing is quicker. Since the distance between landing center and the market is only 3-4 Km, hence during transportation the freshness of the fish does not deteriorate significantly.

Keywords: Freshness, Fish, Landing centre, Fish Market.

Short running title: **Freshness of fish at peri-urban area landing centre and market**

Introduction

Freshness of fish is a universal demand by the consumers. Despite the fact that definition of word "Feshness" differs among the authors and researchers, almost all of them agree that freshness of fish should be retained when fish is on display in the market. It is more desirable in the tropical and subtropical countries where ambient temperature enhances deterioration of fish freshness. Similarly, for the area where fish catch and landing is done far from fish market, road communication or transport facility is not good enough, fisher folk don't understand the deterioration of fish. Fish freshness is also important from fisher folks' trade point of view. If the freshness and quality of fish is low when brought to the market for sale, then the price of fish falls remarkably. To prevent such a loss fisher folk try to find the better way of retaining freshness and quality of their catch. Steps to keep the fish fresh having better quality are taken by the fisher folk in such circumstance. A fresh fish may be defined as "newly caught, not stored or processed having its original quality unimpaired, i.e. not deteriorated in any way" (Stansby, 1963). Freshness is the term applied for the quality of fish, which can be predicted accurately. Most modern definition of the term 'freshness of fish' is the lowering of freshness caused by autolytic action of fish tissue and the so-called deterioration, which is initiated by the onset of spoilage. The former is referred to as 'enzymatic freshness' and the latter as 'bacterial freshness'.

*Department of Fresh Water Biology and Fisheries, University of Sindh, Jamshoro, Pakistan.

**Department of Fisheries Management, Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh.

* Corresponding author, E-mail: nntariq@hotmail.com

Most widely used but very simple method of measuring the degree of freshness of fish is organoleptic method. It is done by human sense. Seven characters of fish are judged and defect points are identified; summing the defect points and dividing the sum by 7 gives the grading. A rating of 5 for any one of the seven characteristics indicates that the fish is in the grade C (Reject) (Howgate *et al.*, 1992).

Usually fish deteriorate during the time elapsed between catch and sell by autolytic change and bacterial spoilage. If time lapse is long, the degree of deterioration is also high. The rate of such deterioration is accelerated by the ambient temperature and oxidation. From practical view point, freshness of fish is assessed by subjective and objective methods. The method which does not require any apparatus is called subjective measurement, while the method which needs apparatus is called objective method. In the present study fish freshness was assessed by both methods.

The present study was undertaken to measure the degree of freshness of fish and to compare the results of such measurement on fish collected from landing centre as well as from the display in market in a peri-urban area of Mymensingh, Bangladesh. Such study is important because in some peri-urban area fish is brought from distant places which are not fresh for many reasons. If the reasons of freshness degradation are improper handling, poor icing, tight packing during transportation to the fish market, attempt for improvement can be made.

Materials and Methods

Study area

Puliamari is a place where fisher folk have been living for more than 100 years. This place is situated on the bank of the river Brahmaputra which is 8 km away from Mymensingh town. It is a peri-urban area with good road communication to Mymensingh in the central north region of Bangladesh. This area is locally known as 'Puliamari village'.

Sample collection

Six fish species from fisher folk's catch were randomly collected from the fishing boats at landing centre. Fish belonging to same species were also collected from Puliamari fish market. The collected samples were kept in ice box with sufficient quantities of ice and transported to the laboratory of the Department of Fisheries Technology, Bangladesh Agricultural University (BAU). On arrival at the laboratory the fish samples were subjected to freshness test in terms of sensory assessment, biochemical analysis, and bacteriological examination. The morphometric and meristic characteristics of the fish samples from landing centre and from market are presented in Table 1.

Freshness test

Freshness test by sensory method was carried out according to the method of Howgate *et al,* (1992). This test is carried out by examining different sensory characteristics of fish as stated in Table 2 (a) During examination, defects are identified and points were recorded. The sum of defect points is divided by 7. The result obtained in this way is used for grading of fish according to Table 2 (b) Grading of fish was done in such a way that if the result was less than 2 the fish is excellent; if it was 2 but less than 5 then the fish is good; if the result was 5 the fish was graded as bad and rejected.

Biochemical analysis

Composition of fish (Crude protein, Lipid, Moisture, Ash), Total Volatile Base Nitrogen (TVB-N), Non Protein Nitrogen

(NPN), were determined according to the methods of AMC (1979).

Bacteriological examination

Total bacterial count expressed as colony forming unit per gram of fish muscle (CFU/g) of the representative samples of fish were determined by standard plate count on plate count agar according to dilution technique (Collins and Patricia, 1976). The presence of coliform was examined by plating the same samples used for total plate count in the previously prepared Violet Red Bile Agar (VRBA) plates. Colonies formed on this selective agar medium were identified by pink - red colour. The presence of pathogenic bacteria (*Salmonella, Shigella*) was examined by plating the samples of bacterial colonies in the previously prepared SSA media plates. Colonies formed on this selective agar media were identified by the shape of the colonies which were colourless. Presence of spoilage bacteria (*Streptococcus, Staphylococcus*) was examined by plating the samples of bacterial colonies in the previously prepared SSA media plates. Colonies formed in this selective agar media were identified by the shape and colour of the colonies.

Results

Results of the morphometric and meristic characteristics are presented in Table 1 and the freshness test by organoleptic assessment of the catch of fisher folk of Puliamari village is shown in Table 2. This assessment was done on the fish samples collected from the landing center as well as from market where the fisher folk usually sell their catch. All fish species were found excellent. Proximate composition of the fish species, from landing centre and market is shown in Table 3. The TVB-N and NPN content of fish is shown in Table 4. The TVB-N and NPN indicate bacterial decomposition in fish although NPN sometimes formed as a result of enzymatic deterioration as well as bacterial degradation of nitrogenous compound while TVB-N is formed by purely bacterial decomposition. Results of bacteriological examination are shown in Table 5. There were no pathogenic, spoilage and coliform bacteria in the fish.

Discussion

It appeared from the results that the fisher folk bring their catch to the landing centre as soon as possible after a desired level of harvest. It also indicates that the captured fish are kept in good condition in the fishing boat where chance of contamination is least by spoilage bacteria. As soon as the catch is brought to the landing centre by a group of fisher folk, another group waiting to receive the catch of the day takes over after purchase and transports it to the nearest market, which needs only 2-3 hours. That is why the catch usually remains excellent. As there is minimum chance of contamination by the spoilage bacteria, no chance of tissue damage or rupture by piling up of a huge catch and finally minimum time elapsed between harvest and marketing , the catch remains in excellent condition in the market. Another reason is that the number of marketing steps are minimum, there is no undue delay by the middlemen and distance between landing center and market is minimum, no need of temporary storage. This is the result of study during the end of summer season. So it is almost perceivable that the result will be at least similar if not better during winter, spring and autumn season. The proximate composition of fish in the present study (Table-3) is supported by the result of Mansur *et al*, (2002) from the same area.

Total volatile base-nitrogen (TVB-N) and Non-protein nitrogen (NPN) are the two main parameters widely used to assess the

degree of freshness of fish. Although most of the studies were on the freshness assessment of marine fish (Kamal, 1977; Islam, 1977) these two parameters are equally acceptable for the assessment of freshwater fish as well. Mansur *et al,* (2002) conducted experiment on freshness test of freshwater fish using these two parameters. In the present study TVB-N and NPN content (Table-4) of the fish samples from landing centre and from market are within the expected range and correlate to the results obtained by other parameters too (Table-2 and Table-5). Very low TVB-N and NPN was found in fish muscle. There was no significant increase in these values during marketing. The TVB-N and NPN content of the fish muscle in this study are within the level recommended for fresh fish (Connell, 1980). This result is supported by the findings of other studies (Connell, 1980; Mansur *et al*, 2002 ;). On the basis of these results it is clear that the fish samples of the present study were extremely fresh. Results of bacteriological examination of fish from landing centre as well as from fish market are shown in Table 5. Total bacterial count was very low. This number is within the range recommended for very fresh fish according to the International Standard (Connell, 1980). Coliform, pathogenic and spoilage bacteria were not at detectable level in these fish samples, so these are not mentioned in Table 5. These groups of bacteria are undesirable in fish and in any food. It appears from the results of bacteriological examination that since the fisherfolk transport their catch to the market within short period after landing, the total bacterial count in the fish did not increase significantly.

It appears from the results of this study that the origin of fish (river water) of this study is reasonably better and unpolluted than the overall situation prevailing in the rivers and other water bodies of major cities. The fisherfolk keep their catch in very good condition in the boat, fishing hours are reasonably shorter, marketing step is minimum, the distance between landing centre and market is only 3-4 km so during transportation freshness of fish is not reduced significantly.

Table 1: Morphometric and meristic characteristics of fish species.

Fish species	Weight (g)		Length (cm)		Skin colour*		Consistency of flesh**		Physiological condition	
	S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2
L. rohita	149	157	21.3	22.1	Bright	Bright	Hard & elastic	Hard & elastic	Pre-spawning	Pre-spawning
C. catla	181	192	24.9	26.1	Bright	Bright	Hard & elastic	Hard & elastic	Pre-spawning	Pre-spawning
C. mrigala	182	192	24.1	24.9	Bright	Bright	Hard & elastic	Hard & elastic	Pre-spawning	Pre-spawning
C. carpio.	212	192	25.9	24.1	Bright	Bright	Hard & elastic	Hard & elastic	Pre-spawning	Pre-spawning
H. molitix	194	187	24.6	23.1	Bright	Bright	Hard & elastic	Hard & elastic	Pre-spawning	Pre-spawning
P. stigma	16.2	17.5	9.9	10.6	Bright	Bright	Hard & elastic	Hard & elastic	Pre-spawning	Pre-spawning

S_1 = Sample from landing centre
S_2 = Sample from market

* By eye assessment
** By finger touch

Table 2 (a): Determination of Defect points.

Characteristics of whole fish	Defect characteristics	Defect points	Grade
Odour of neck when broken	Natural/ Neutral odour.	2	Acceptable
	Medium or strong sour odour or putrid.	5	Rejected
Odour of gills	Natural/Neutral odour	1	Excellent
	Faint sour odour	2	Acceptable
	Slight to moderate sour odour	3	Acceptable
	Moderate to strong sour odour.	5	Rejected
Colour of gills	Slightly pinkish red.	1	Excellent
	Pinkish red, brownish red, some mucus may be present.	2	Acceptable
	Brown or gray colour and may be covered with mucus.	3	Acceptable
	Bleached; thick yellow slime	5	Rejected
General appearance	Full bloom; bright, shining; iridescent.	1	Excellent
	Slight dullness and loss of bloom	2	Acceptable
	Definite dullness and loss of bloom	3	Acceptable
	Reddish lateral line; dull, no bloom	5	Rejected
Slime	Usually clear, transparent and uniformly spread	1	Excellent
	Becoming turbid opaque and milky	2	Acceptable
	Thick, sticky, yellowish or green in colour	5	Rejected
Eye	Bulging with protruding lens; transparent eye cap	1	Excellent
	Slight cloudy lens and sunken	2	Acceptable
	Dull, sunken, cloudy	3	Acceptable
	Sunken eye covered with yellow slime	5	Rejected
Consistency of flesh	Firm and elastic;	1	Excellent
	Moderately soft and some loss of elasticity;	2	Acceptable
	Some softening	3	Acceptable
	Limp and floppy.	5	Rejected

Table 2 (b): Grading of fishes.

Grade	Points	Comments/Degree of freshness
A	Less than 2	Excellent/ Acceptable
B	2 to less than 5	Good/Acceptable
C	5 and above	Bad/ Rejected

Table 2 (c): The over all freshness of fish species at the landing center and in the market.

Fish species	Grade points and degree of freshness	
	Landing center (S_1)	Market (S_2)
Labeo rohita	Less than 2 Excellent/Acceptable	Less than 2 Excellent/Acceptable
Catla catla	Less than 2 Excellent/Acceptable	Less than 2 Excellent/Acceptable
Cirrhina mrigala	Less than 2 Excellent/Acceptable	Less than 2 Excellent/Acceptable
Cyprinus carpio	Less than 2 Excellent/Acceptable	Less than 2 Excellent/Acceptable
Hypophthalmichthys molitrix	Less than 2 Excellent/Acceptable	Less than 2 Excellent/Acceptable
Puntius stigma	Less than 2 Excellent/Acceptable	Less than 2 Excellent/Acceptable

S_1 = Sample from landing centre S_2 = Sample from market

Table 3. Proximate composition of the freshwater fish used in the present study.

Fish species	Moisture (%)		Protein (%)		Lipid (%)		Ash (%)	
	S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2
L. rohita	79.96	78.76	14.41	14.82	5.28	5.56	1.21	1.02
C. catla	79.72	79.41	15.47	14.92	5.22	5.46	1.09	1.15
C.mrigala	75.14	74.20	17.62	16.21	5.92	5.21	2.17	2.07
C. carpio.	76.86	76.12	15.21	15.92	4.98	5.02	1.57	1.79
H. molitix	78.77	78.01	14.31	14.91	4.69	5.09	1.31	1.52
P. stigma	74.23	75.03	17.21	17.19	4.41	4.09	2.19	2.50

S_1 = Sample from landing centre S_2 = Sample from market

Table 4: TVB-N and NPN of the fish used in the present study.

Fish species	TVB-N (%)		NPN (%)	
	S_1	S_2	S_1	S_2
L. rohita	8.79	8.12	0.049	0.053
C. catla	8.52	8.81	0.057	0.054
C. mrigala	9.12	9.34	0.067	0.073
C. carpio.	8.71	8.95	0.051	0.059
H. molitix	8.37	8.63	0.061	0.067
P. stigma	9.01	9.46	0.071	0.078

S_1 = Sample from landing centre S_2 = Sample from market

Table 5: Total bacterial count of the freshwater fish in the experiment.

Fish species	Total bacterial count (CFU/g)	
	S_1	S_2
L. rohita	1.72×10^7	1.97×10^7
C. catla	2.17×10^6	2.93×10^6
C. mrigala	1.91×10^6	2.27×10^6
C. carpio.	1.55×10^7	1.75×10^7
H. molitix	2.01×10^6	2.57×10^6
P. stigma	1.95×10^7	1.65×10^7

S_1 = Sample from landing centre S_2 = Sample from market

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