Short Communication

Bacterial Load of Raw Hilsha (*Tenualosa ilisha*) Collected from Catching Points, Open Market and Departmental Shop

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Routine microbial analysis of raw fish at different stages from catching to selling point up to consumer level is important for assessing the quality of fish. In this study, bacterial load of Hilsha (*Tenualosa ilisha*) collected from different catching points, open market and department shop was determined. Samples collected from catching points contained considerably more bacteria than those collected from open market or department shop. This result indicated that fish traders might use some preservatives that reduced the bacterial load. Besides, fish from department shop contained more bacteria than fishes from open market. The possible reason for this variation might be due to fact that the unsold fishes were kept longer times in the department shops. Among the different parts of fish body, maximum number of bacteria was found in scale and skin followed by gill, gut and muscle. High number of coliform bacteria was also found in the samples tested. Proper handling and precautions is important for maintaining the quality of Hilsha.

Keywords: Bacterial load, Hilsha (*Tenualosa ilisha*), Coliform, Faecal coliform

Fisheries sector is playing a very vital role regarding employment generation, protein supply, foreign currency earning and poverty alleviation. According to the report of Department of Fisheries (DoF), fisheries sector is contributing 5.71% of the total export earning and 4.92% to the GDP[1]. About 2 million people are directly or indirectly involved in this sector[2]. Hilsha (*Tenualosa ilisha*), the national fish of Bangladesh, contributes about 13% in the total fish production of the country. At present the average Hilsha production in our country is 200,000 metric tons, which is equal to about Taka 2,000 crore[1].

Fish is one of the most highly perishable foods. As a considerable portion of fresh fish fail to reach to the consumers in an acceptable form due to deteriorative changes during harvesting, sorting, handling, storage, transportation and marketing, our country is deprived of earning foreign currency. So, it is necessary to investigate and find out the factors responsible for quality changes in fresh fish. Fish quality is directly related with bacterial load, which is dependant on the condition of transport, handling and processing. The trawlers that are engaged in catching Hilsha at the rivers and sea mostly do not have necessary preservation facilities. After catching, the fish is stored at huts on the dirty floors at room temperature for quite a long time before freezing, storing and processing. The water used for fish washing is mostly contaminated with spoilage organisms and pathogens. The ice that is used to preserve fish primarily in fishing trawlers, at landing centres and local markets is also contaminated heavily with microorganisms.

As the quality of fish continuously changes during different stages from harvesting to marketing, a study was therefore carried out to determine the bacterial loads in different organs of Hilsha and to compare the bacterial load of raw fish collected from catching points, open market and department shop.

Raw Hilsha samples (weight: 600-800 g, length: 36-40 cm) were collected from Chandpur and Aricha (recognized catching sites of Hilsha), from an open market (New Market, Dhaka) and from a department shop (Meena Bazar, Dhaka). The collected samples were preserved at 4ºC in insulated box during transport. Samples from various portions of fish, *viz.*, scale and skin, flesh, gills and gut, were collected aseptically, homogenized separately and then mixed with Ringer solution. The homogenized samples were diluted necessarily and pre-enriched in lauryl broth for 1 to 2 h at 37ºC with vigorous shaking. Small volume of pre-enriched culture was then plated in plate count agar (PCA) using pour plate technique and incubates at 37ºC for 24 to 48 h. For the detection of coliform and faecal coliform bacteria in the pre-enriched samples, all presumptive, confirmed and completed tests were done according to standard protocol[3]. The enumeration of total coliform and faecal coliform was done by most probable number (MPN) method.

The quality of fishes was determined by simple organoleptic assessment[4], which is very important from economic point of view[5]. The glossiness of fish skin was higher in samples collected from open market and department shop than samples from catching points (Table 1). This might be due to fish traders used

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Table 1. *Organoleptic assessment of Hilsha (Tenualosa ilisha) collected from different sources*

Parameter	Organoleptic properties			
	Catching point: Chandpur	Catching point: Aricha	Open market	Departmental shop
Eye	Eye level slightly sunken into socket	Surface of eye slightly concave	Eye level with socket	Eye level with socket
Body colour	Dull	Dull	A little dull	A little dull
Skin gloss	A little gloss	A little gloss	Intact and high gloss	Intact and high gloss
Smell	Definite fish smell	Definite fish smell	Slight fish smell	Slight fish smell
Gill colour	Gills bright pink	Gills bright pink	Gills bright pink	Gills bright pink

some chemical preservatives, which made the fish body stiffed and it seemed to be fresh in organoleptic observation. Another important observation was that the gill colour was similar in all samples collected from different places. But the gill colour usually had been deteriorating with time and the colour turned from bright pink to fade red or brown. It indicates that the fish traders might use dye or fresh blood so that the gill seemed to be fresh.

The bacterial load was higher in the fish samples collected from catching points than those from the open market or the department shop (Table 2), which is unusual because the bacterial load is supposed to be low just after catching and thereafter it should increase gradually with time. The possible reason of such finding might be due to the fact that fish traders use some kind of chemical preservatives that might cause reduction of bacterial load. Besides, the fish traders generally wash the raw fish many times at different stages of handling even before final display in the markets to give the fishes a fresh look. It has also been reported that the fish caught close to land masses have significantly higher microbial load as compared with fishes caught at a distant from land[6].

Table 2. *Total bacterial counts (cfu/g) in different parts of Hilsha collected from various sources*

Fish part	Total bacterial count (cfu/g)			
	Catching points: Chandpur	Catching points: Aricha	Open market	Departmental shop
Skin and scale	3.7×10^9	9.4×10^9	3.1×10^8	2.1×10^8
Gills	2.6×10^8	5.96×10^9	1.1×10^8	8.5×10^7
Muscle	3.0×10^7	6.0×10^7	2.7×10^8	4.0×10^7
Gut	4.8×10^8	1.5×10^9	9.0×10^7	8.0×10^8

The surface (scale and skin) of fish contained the highest number of bacteria as because the slime layer of skin affords a luxuriant growth of many different bacteria. Again, it was found that the number of bacteria in the gut was higher than that in the gills. It is known that Hilsha is primarily a plankton-feeder and there is evidence that phytoplankton and zooplankton are also contaminated with bacteria that might influence the number of bacteria in gut in our tested samples[7-9]. After death, the fish had to cross rigor mortis condition and then the body of fish act as a suitable media for the growth and multiplication of bacteria.

There is a general belief that departmental shops always provide quality products than local markets. But in our study, it was found that the bacterial load was higher in samples from the departmental shop than that of open market. The possible reason of this finding might be related to the storage period. Fish is usually kept in the departmental shop for long times until they are sold. Sometimes department shops keep these kinds of highly perishable product more than 2-3 days, but in open market this facility is absent and all fishes are sold within short time.

Total coliform was present in almost all the samples tested but the count was higher in the samples collected from Aricha catching point. It is known that the flora of living fish depends upon the microbial content of the water in which they live. Aricha is closer to land masses than Chandpur and the water of Aricha may be more polluted than Chandpur. The faecal coliform was found only in two samples in this study; one in the fish skin from Chandpur and another in the gills from Aricha. This indicates that the water of these areas was somehow contaminated with faecal materials from the surrounding areas or the ice that was used for preservation might contain faecal and other coliform bacteria.

Table 3. *Total coliform and faecal coliform bacterial counts (MPN/g) in different parts of Hilsha collected from various sources*

Fish part	Total coliform / Faecal coliform count (cfu/g)			
	Catching points: Chandpur	Catching points: Aricha	Open market	Departmental shop
Skin and scale	1.5 / 0.18	1.7 / Nil	0.6 / Nil	0.2 / Nil
Gills	0.8 / Nil	1.2 / 0.18	0.2 / Nil	0.4 / Nil
Muscle	Nil / Nil	Nil/ Nil	Nil / Nil	Nil / Nil
Gut	0.7 / Nil	1.3 / Nil	0.2 / Nil	Nil / Nil

The variation in types and number of bacteria is greatly influenced by the immunological responses of fish that vary with age, size, breeding season, food habit, environmental temperature and species[10]. The different organs of same fish may have selection capability due to the above mentioned responses. Overall environment in which the fish may inhabits, processes or transport also be responsible for such variations[6, 11-12].

In conclusion, bacterial load of raw Hilsha do not quality the requirement specified by the International Commission on

Microbiological Specification for Food (ICMSF)[13]. To save the Hilsha industries in Bangladesh, immediate preventive measures should be taken. Routine microbial analysis and implementation of hazard analysis and critical control point (HACCP) principles can play a major role to keep the Hilsha fish quality of international standard.

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