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Biochemical and Microbiological Quality of *Labeo gonius* stored in Ice

H. Lilabati and W. Vishwanath
Department of Life Sciences
Canchipurr - 795 003. Manipur, India

Biochemical and microbiological qualities of ice-stored *Labeo gonius* sold in the Imphal market of Manipur were studied over a period of three months from September to November 1994. The fish were nutritionally rich having a protein content of 18.61%. Total volatile base nitrogen values (12.0 mg%) and thiobarbituric acid values were within permissible limit. Total plate counts were the highest in the gill (log 8.00-9.00 cfu g^{-1}) and lowest in the muscle (log 5.00-6.00 cfu g^{-1}). Coliforms, *Staphylococcus aureus* and faecal *streptococci* were detected in the samples whereas *E. coli* and *Salmonella* were absent.

Key words: *Labeo gonius*, Imphal market, biochemical composition, microbiological quality

Fish is an important source of animal protein for the people of Manipur. As the fish production of this state does not meet the demand of the growing population, a large quantity of iced carp and catfish are brought from other states of India. During transport the fish is iced in the ratio 2-3:1 and packed in bamboo or plywood boxes lined with leaves or gunny bags. They reach the market after a long time after the catch (Vishwanath & Lilabati, 1995). There is no report on the quality of the ice- preserved consignments of fish reaching the state except some preliminary work done by Vishwanath & Lilabati (1995). A detailed investigation on the quality of carp, *Labeo gonius* sold in the Imphal market was undertaken and the results are presented in this paper.

Materials and Methods

Fish weighing about 1-1.5 kg were purchased randomly from the Imphal market and brought to the laboratory in aseptic condition. Such sampling was done weekly for three months, from September to November, 1994. 50 g muscle were sampled randomly from different parts of the fish for biochemical analysis. Total nitrogen (TN) non protein nitrogen (NPN), moisture, lipids and ash were estimated following AOAC (1975) methods. Crude protein (CP) values were calculated by multiplying the corresponding values of TN by 6.25. Free fatty acid (FFA) and total volatile base nitrogen (TVBN) were determined as per the method of Morris (1959). pH value was measured using pH meter, thiobarbituric acid (TBA) number was determined as per Sinhuber & Yu (1958).

Samples of gills, intestine and muscle (50 g) and skin (10 cm^2) were macerated in saline water (0.85%) to obtain decimal dilution. Appropriate dilutions were used for plating in the respective media. Total counts of bacteria (TPC), total counts of fungi (TFC), MPN counts of coliform and detection of pathogenic bacteria, viz., *E. coli*, *Salmonella*, *Staphylococcus aureus* and faecal *Streptococci* were carried out as per the methods of APHA (1976). Total viable bacteria and total fungi were determined at

ambient temperature (28±2°C). Bacterial colonies from plate count agar were picked and identified up to generic level as per Buchanan & Gibbon (1974). Fungal colonies on potato dextrose agar (PDA) were picked, stained with cotton blue in lactophenol and identified based on the methods of Gilman (1957) and Ellis (1971, 1976).

Results and Discussion

Biochemical compositions of the fish are shown in Table 1. Moisture content was 78%. The main indices of quality like TBA number, TVBN and pH were within acceptable limits. TBA value was 0.6 mg malonaldehyde/kg. Sinhuber & Yu (1958) reported that products with less than 3 mg malonaldehyde/kg can be considered as acceptable. TVBN content of the muscle was 12.0 mg% and pH was 6.5. Perigreen *et al.* 1987) found that TVBN content of murrel stored in ice for 13 days was 16.2-18.9 mg% and the sample was unacceptable. Ali *et al.* (1992) also have reported similar results. Findings of the present study are in agreement with these observations.

Bacterial and fungal counts of iced *L. gonius* are presented in Table 2. Bacterial count was highest in the gill (log 8.00-9.00 cfu g^{-1}) and lowest in the muscle (log 5.00-6.00 cfu g^{-1}). Nair *et al.* (1971) also made similar observation in the case of *C. mrigala.* The gill is an ideal site for microbial growth (Russel & Fuller, 1979). The count in skin varied between log 6.00-8.00 cfu cm^{-2}. This variation in the count may be due to washing by melting of ice (Nair *et al.*, 1971).

Table 1. Biochemical composition of iced *Labeo gonius* (mean±SD of 12 samplings)

Moisture	78.0±0.72
Crude protein (% WWB)*	18.6±0.38
NPN (% WWB)	0.5±0.011
Total lipid (% WWB)	1.3±0.09
TVBN (mg/100g)	12.0±2.00
TBA No. (mg melonaldehyde/kg)	0.6±0.077
Ash (% WWB)	0.7±0.01
PH	6.5±0.15

*WWB = wet weight basis

Coliform count (MPN) ranged from 1.00-2.00 log g^{-1} or cm^{-2}. This low value may

Table 2. Bacteria and fungi in different tissues of iced *Labeo gonius* (log cfu cm^{-2} in skin; log cfu g^{-1} in other tissues) (mean of 12 samples)

Tissue		Total plate count of bacteria	Total plate count of fungi	*Staphylococcus*	Coliforms (MPN)	Faecal *Streptococci*
Skin	Mean	7.653	2.053	1.919	2.707	4.113
	Range	6.903-	1.954-	0.968-	1.954-	3.447-
		8.342	3.477	2.079	3.113	4.491
Muscle	Mean	6.110	1.801	1.328-	2.929	2.462
	Range	5.255-	0.000-	0.000-	2.079-	1.778-
		6.414	2.000	1.806	3.301	2.845
Gill	Mean	8.763	2.819	1.718	3.103	2.131
	Range	8.579-	2.447-	0.477-	2.041-	2.301-
		9.079	3.041	2.079	3.531	2.623
Intestine	Mean	7.853	1.884	2.093	2.908	2.832
	Range	7.414-	1.698-	1.968-	2.301-	2.491-
		8.146	2.000	2.204	3.255	3.041

Table 3. Different species of bacteria in iced *Labeo gonius* as % of total bacterial flora (Result of 12 samplings)

Bacteria	Gill	Skin	Intestine	Muscle
Acinetobacter	10.53-25.00	15.00-18.18	11.43-15.38	8.89-10.77
Aeromonas	5.26-8.33	6.82-17.50	7.69-7.86	6.11-12.31
Flavobacterium	0-13.16	0-6.25	3.85-7.14	5.56-6.15
Micrococcus	17.11-20.83	7.50-13.64	8.08-8.57	6.67-9.62
Moraxella	5.50-12.50	11.36-13.75	14.62-15.00	11.67-13.85
Pseudomonas	2.63-12.50	12.50-25.00	15.77-21.43	15.38-27.78
Vibrio	0-5.26	0-8.18	7.69-14.29	8.08-11.11
Enterobacteriaceae	ND	ND	0-4.23	ND
Unidentified	7.89-20.83	6.25-22.73	14.29-22.69	22.22-23.85

ND = Not detected

be due to cold shock (Perigreen *et al.*, 1987) during icing. *Salmonella* and *E. coli* were not detected in any of the samples but faecal *Streptrococci* was present. The presence of highly resistant faecal *Streptococci* and coliform indicates faecal contamination of the fish and probable presence of enteric pathogen (Frazier & Westhoff, 1978). *Staphylococcus* was present to the extent of log 2.00-3.00 g^{-1} or cm^{-2}. This contamination might be due to handling. Out of three strains isolated, one was coagulase positive *Staphylococcus*. The incidence of this organism in the fishery product within limits is not a serious problem. However, careless handling during processing results in the multiplication of the organism, which may lead to food poisoning.

Eight probable genera of bacteria were identified (Table 3). Among those, six were psychrophiles. *Acinetobacter, Micrococcus* and *Pseudomonas* were found in higher percentage. Ali *et al.*, (1992) and Surendran & Gopakumar, (1981) had observed that *Aeromonas* and *Pseudomonas* were the main microorganisms associated with freshwater fish.

The details of the fungi isolated from the samples are presented in table 4. Packing materials such as saw dust, leaves or boxes used for insulation at the time of transport or marketing may be sources of such organisms. It was also probable that the landing and initial packing sites were contaminated with the fungi. The possibility of

Table 4. Fungal species in iced *Labeo gonius* as % of total fungal flora (Result of 12 samplings)

Fungi	Gill	Skin	Intestine	Muscle
Aspergillus	0-10.25	0-12.50	50.00-100.00	13.33-100.00
Cladosporium	ND	0-12.50	ND	ND
Fusarium	ND	12.50-25.00	ND	ND
Geotrichum	10.25-83.3	0-25.00	ND	ND
Penicillium	0-13.33	25.00-50.00	13.33-50.99	16.66-100.00
Gleocladium	0-16.66	ND	ND	ND
Strile mycelia	0-12.75	12.50-75.00	16.66-50.00	ND

ND = Not detected

the incidence of toxic fungi or fungal metabolites leading to food poisoning cannot be ruled out unless proper care is taken.

This study shows that the quality of iced *L. gonius* sold in the Imphal market of Manipur may be improved by establishment of proper cold storage and processing facilities in the state. Strict care during selection and processing of the fish will help to maintain the quality of fish reaching the consumer.

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