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Iced Storage Characteristics of Pearl spot *(Etroplus suratensis)* Caught from Cochin Backwaters

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Iced storage life of pearl spot *(Etroplus suratensis)* was determined bacteriologically, biochemically and organoleptically. The total aerobic plate count increased from 10^4 g^{-1} muscle to 10^8/g in 23 days. The total volatile base nitrogen registered gradual increase during storage, while extractable sarcoplasmic and myofibrillar proteins decreased. Organoleptically the fish became unacceptable in 10–14 days in ice. The results indicated that pearl spot remained in more or less prime condition in ice for 8–10 days.

The extensive brackish water areas along Kerala coast is rich in fishery wealth playing an important role in her coastal economy. Eventhough a lot of work had been done on the development of proper post harvest technology for marine fish, such studies on brackish water fishes are limited. Recently, Joseph *et. al.* (1980) have made an elaborate study on the iced and frozen storage characteristics of brackish water milk fish *(Chanos chanos)*. Pearl spot *(Etroplus suratensis)* is an important table fish, abundant in the coastal brackish water lagoons of Kerala. A fully grown fish of this species weights between 600 to 1000 g. The nature of the bacterial flora associated with pearl spot has been reported in an earlier paper (Surendran & Iyer, 1980). Iced storage characteristics and selection of bacterial types during storage are presenied in this paper.

Materials and Methods

Live pearl spots, weighing between 400 g and 900 g were collected from Poothotta and Murinjapuzha which form part of Cochin backwaters. The fish after washing in the brackish water itself was packed in crushed ice, in the ratio 1:1 and transported immediately to the laboratory, repacked in crushed ice and stored in insulated boxes. Ice losses were made up by the addition of fresh ice usually on alternate days.

Initial sampling of the fish was done immediately on reaching the lab and thence, after interval of 3 to 5 days during storage. The total bacterial count (TPC), total coliform count and faecal streptococci count were determined as described by Surendran & Iyer (1980). Total volatile base nitrogen (TVBN) was determined by the microdiffusion method of Conway (Conway, 1947). The sarcoplasmic and myofibrillar proteins were extracted by the method of Paul *et. al.* (1966). The protein content was determined calorimetrically by the biuret method (Work & Work, 1969). Sensory evaluation of the samples was made in the raw and cooked states by a taste panel using the method described by Surendran & Iyer (1971). Bacterial cultures were isolated from TPC plates during each sampling. The cultures were morphologically and biochemically characterised and classified by the method of Surendran (1980) and Surendran & Gopakumar (1981).

Results and Discussion

The bacterial profile of the fresh pearl spot is presented in Table 1. The bacterial load on the skin surface was found to vary beteeen 1.2×10^3 and 4.3×10^4 cm^{-2}, that of gills between 2.3×10^4 and 1.14×10^6 g^{-1} and that of intestine with contents between 1.15×10^5 and 2.08×10^6 g^{-1}.

The count of the total coliforms was very much higher in the intestine with contents, but the proportion

Table 1. *Bacterial count at different parts of pearl spot*

Name of the count	Skin surface cm^{-2}	Gills g^{-1}	Intestine with contents g^{-1}
Total plate count	$1.2x10^3$ to $4.3x10^4$	$2.3x10^4$ to $1.14x10^6$	$1.15x10^5$ to $2.08x10^6$
Total coliforms	Nil to $1x10^3$	Nil to 27	$7x10^3$ to $2.4x10^5$
Total faecal coliforms	Nil	Nil	Nil to 120
Streptococci	Nil to $1.1x10^2$	Nil to 43	Nil to 240
Staphylococci	Nil	Nil	Nil
Salmonella	Nil	Nil	Nil

of faecal coliforms was very less. Also, faecal coliforms were not isolated from the skin surface or gill tissue, eventhough in some cases non-faecal coliforms were isolated. The presence of faecal streptococci was minimal. Staphylococci and salmonella were absent.

In Tables 2 and 3 are given typical results of iced storage study of pearl spot. The total bacterial counts of both the skin with muscle and intestine with contents exhibited an initial decrease. It was followed by a steady increase in counts. By the 12th day in ice, the TPC of the skin with muscle reached 10 million g^{-1} and by 23 days one hundred million per gram.

Table 2. *Changes in bacterial count during iced storage of pearl spot*

Days of storage	TPC of skin with muscle g^{-1}	TPC of intestine with contents g^{-1}
0	5.098×10^4	1.523×10^7
3	2.963×10^4	3.328×10^5
7	4.5×10^5	1.06×10^6
12	3.44×10^7	4.9×10^8
23	1.09×10^8	3.14×10^8

Table 3. *Changes in the organoleptic qualities of pearl spot during iced storage*

Days of storage	Organoleptic qualities of raw fish	Organoleptic score of the cooked muscle
0	Fresh. bright and lustrous appearance; soft but firm texture, with characteristic fresh odour. Overall quality excellent.	20
3	A decrease in the brightness, slightly softer texture. Raw fish odour. Overall quality good.	17
7	The bright sheen is lost. Surface is covered with slime. The flesh is soft. Overall quality fair.	12
10	Slimy surface and soft texture. Overall quality in the limit of acceptance.	12
12	Fish has dull appearance, with blood and slime on surface.	8
23	Completely spoilt	0

On the basis of the organoleptic qualities of the cooked muscle, the pearl spot remained in acceptable condition for nearly 12 days in ice. However, judging by the appearance and smell of the raw fish, pearl spot was in prime condition only upto 8–10 days in ice (Table 3).

Changes in major nitrogenous constituents of pearl spot during iced storage are shown in Table 4. The increase in total volatile base nitrogen was rapid after 7 days in ice. There was no predominant decrease in the extractability of myofibrillar protein fraction upto 12 days of iced storage, which indicates that the main structural protein in the myofibrillar fraction is not denatured to a considerable extent. However, after 12 days, there is a rapid decrease in its extractability, indicating textural damage and consequent loss of quality of the muscle. The amount of extractable sarcoplasmic proteins did not appear to change significantly.

Table 4. *Changes in major nitrogenous constituents of pearl spot during iced storage*

Days of storage	TVBN mg $(100\,g)^{-1}$	Sarcoplasmic protein nitrogen % of total N	Myofibrillar protein nitrogen % of total N.
0	8.7	30.75	38.40
3	8.4	32.20	38.62
7	12.6	26.68	33.55
12	28.2	25.22	31.81
23	49.5	28.40	24.53

The iced storage characteristics of pearl spot were more or less similar to those of *Chanos chanos*, for which a storage life of 12–14 days was reported (Joseph et al. 1980). However, pearl spot has a shorter iced storage life, remaining in acceptable condition only for 8–10 days. This difference may be due to many factors, including the difference in their native flora, which has a distinct role in their spoilage.

The selection of bacterial population during iced stored of pearl spot is presented in table 5. The initial flora of the fresh fish comprised of *Pseudomonas* (25%), *Alcaligenes* (10%), *Micrococcus* (20%), *Flavobacteria* and *Moraxella* (5% each), *Vibrio* (7%), *Bacillus* (5%) and *Enterobacteriaceae* (5%). The flora appears to be similar to marine fishes like oil sardine and mackerel, in that the bulk of the flora is mainly comprised of Gram negative asporogenous rods or cocci. (Surendran & Gopakumar, 1981). However, the flora of pearl spot is characterised by the presence of a higher proportion of Gram positive types like *Micrococcus* and *Bacillus*.

Table 5. *Qualitative changes in bacterial flora on skin, during iced storage of pearl spot*

Bacterial genus	Days of storage		
	0	7	23
Pseudomonas	25	16	61
Alcaligenes	10	12	10
Micrococcus	20	14	4
Flavobacteria	5	5	3
Moraxella	5	7	12
Bacillus	5	4	0
Vibrio	7	8	1
Coliforms	5	2	0

During iced storage, the flora underwent significant changes. There was a preferential establishment of certain groups like *Pseudomonas, Alcaligenes* and *Moraxella.* At the time of apparent spoilage of the fish in ice, i.e., by about 23 days in ice, the major group was the *Pseudomonas* spp. This showed that *Pseudomonas* spp. constituted the major spoilage type in the case of brackish water fishes. This observation is very much similar to that in the marine fishes, where the *Pseudomonas* group constitutes the major spoilage flora during iced stroage. This similarity might be because of the fact that many members of the *Pseudomonas* are psychrophilic and at the same time proteolytic too (Surendran & Gopakumar, 1982).

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