

STUDIES ON THE STORAGE CHARACTERISTICS OF SILVER POMFRET (*Pampus argenteus*) TRANSPORTED TO BOMBAY

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An investigation on the quality of pomfrets transported to Bombay from Gujarat coast and its subsequent changes during storage at room temperature and low temperature were carried out and the results reported. The pomfrets transported in boats having insulated holds were in better condition than those having non-insulated holds. In general, the transported fish can be effectively stored in ice for 2 days, while the fish is in acceptable condition upto 4 days.

INTRODUCTION

Among the different types of commercial fishes transported to Bombay from neighbouring places in Maharashtra and Gujarat, silver pomfrets (*Pampus argenteus*) are the 'Choice fish' which come in large quantities from Gujarat in iced condition. During the season an average of over 3000 metric tons of pomfrets are being transported to Bombay to be consumed as fresh and frozen for the monsoon months.

Fish from different villages in Gujarat are collected at a centralised place and transported in country crafts and boats having insulated or non-insulated holds after proper icing. In the trade it is the practice to use more ice when the fish are

transported in non-insulated holds. The duration of transport of fish in these vessels from Veraval to Bombay is roughly 24 to 30 hours, the time being dependent on the climatic conditions. As the fish is being handled at different centres before it arrives in Bombay, it is essential to know the quality of the fish landed at Bombay. Due to the paucity of such data, studies were undertaken, the results of which are presented in this paper.

MATERIALS AND METHODS

The samples were collected from the boats having insulated and non-insulated holds on different days, during the season. For studying the storage characteristics reasonably fresh samples having the same physical characteristics were taken. Mini-

mum of 1 to 2% of the total consignment from each boat were taken for physical and organoleptic observation. From the organoleptic observation the fish are broadly divided into grades ranging from 'excellent' to 'poor'.

Grade I

'Excellent' Bright appearance, clear bright eyes, bright red gills, white mucous, characteristic fresh fish odour and firm texture.

Grade II

'Very good' Slightly dull appearance, bright eyes, bright red gills, dull white mucous, characteristic fresh fish odour and firm texture.

Grade III

'Good' Slightly dull appearance, eyes not very bright, red gills, dull white mucous, fishy odour, and firm texture.

Grade IV

'Fair' Dull appearance, dull eyes, red gills, red mucous, fishy odour with slight off odour and firm texture.

Grade V

'Poor' Dull appearance, dull sunken eyes, brownish red gills, brownish red mucous, slightly stale odour and texture not so firm.

The total volatile nitrogen (TVN) and trimethylamine nitrogen (TMAN) were determined by the method of Conway and Byrene (1933). The alpha amino nitrogen was determined by the Pope and Stevens method (1939) using the trichloroacetic acid extracts. Thiobarbituric acid number was determined by the distillation method of Tarladgis *et al.* (1960) and the total bacterial plate count was determined according to the method prescribed in the ISI specifications for frozen prawns (1962).

RESULTS AND DISCUSSION

In Table 1, physical and organoleptic observations are given. A critical analysis of the data shows that the average percentages of grade I and II quality fish in insulated holds are 8 and 44, respectively while in the non-insulated holds it is only 4.5 and 34. This shows that the fish is preserved better in insulated holds and it also minimises the meltage of ice considerably.

In Table 2, the chemical and bacteriological quality of the fish transported in different lots are given. It is observed that total volatile nitrogen, trimethyl amine nitrogen and alpha amino nitrogen, of the fish transported in insulated and non-insulated holds did not show much difference as compared with the organoleptic observations. Except in a few cases, the values for the rest of the samples analysed were well within the ranges for the fish in acceptable condition. The thiobarbituric acid number of the different lots showed that there is not much rancidity development in the transported fish. It varied from 0.96 to 3.41 mg of malonaldehyde per kg of muscle and 0.98 to 3.21 mg of malonaldehyde per kg of muscle in the case of insulated and non-insulated holds, respectively. The total bacterial count did not show much variation in the samples analysed from insulated and non-insulated holds. There is no incidence of coliforms or *E. Coli* in the samples analysed.

Chemical and bacteriological quality of the different grades of the fish are given in Table 3. The TVN and TMAN did not show much difference in grade I and grade II, and the bacterial count was also less when compared with the other grades. There is a gradual increase in the TVN, TMAN and bacterial count in grade III, IV and V. There is a definite increase in the total plate count in the last grade of the samples.

TABLE I PHYSICAL AND ORGANOLEPTIC OBSERVATIONS OF THE POMFRETS TRANSPORTED FROM VERAVAL TO BOMBAY BY COUNTRY CRAFTS AND BOATS IN INSULATED AND NON-INSULATED ICE HOLDS

Sample No.	Average length in cms	Average weight in g	Percentage of GRADES				
			I	II	III	IV	V
INSULATED ICE HOLDS							
1.	18.4	355	10	30	49	8	3
2.	19.1	374	7	35	43	12	3
3.	20.8	397	8	63	7	20	2
4.	22.1	425	11	36	30	20	3
5.	22.4	538	6	53	8	30	3
6.	16.5	198	4	50	7	36	3
7.	20.6	368	6	23	35	32	4
8.	22.0	481	12	45	4	35	4
9.	16.5	215	10	66	7	12	5

NON-INSULATED ICE HOLDS

1.	18.6	312	3	44	9	38	6
2.	21.3	468	3	50	20	18	9
3.	20.1	484	2	40	27	12	9
4.	18.8	312	4	52	11	20	13
5.	19.6	369	8	31	27	30	4
6.	21.2	497	6	13	28	37	6
7.	21.7	482	4	19	4	66	7
8.	17.7	283	8	38	20	31	3
9.	19.6	368	2	20	38	21	12

TABLE II CHEMICAL AND BACTERIOLOGICAL QUALITY OF POMFRETS
TRANSPORTED FROM VERAVAL TO BOMBAY BY COUNTRY CRAFTS
AND BOATS IN INSULATED AND NON-INSULATED ICE HOLDS

Sample No.	Total volatile N	Trimethyl amine N	Alpha amino N	Thio barbituric acid No.	Total plate count count/g
	 mg%			
INSULATED ICE HOLDS.					
1.	17.16	2.73	33.91	1.58	1.98×10^6
2.	18.20	2.73	12.78	2.69	6.15×10^5
3.	14.71	1.30	15.05	0.96	5.45×10^4
4.	17.60	2.60	17.81	3.41	1.15×10^6
5.	15.50	2.17	17.55	1.89	4.65×10^5
6.	14.35	1.31	18.10	2.11	3.06×10^5
7.	18.15	1.39	20.20	2.01	5.06×10^5
8.	16.62	2.81	19.30	3.24	4.56×10^5
9.	15.01	3.02	18.20	1.16	3.56×10^5
NON-INSULATED ICE HOLDS.					
1.	19.20	2.17	24.28	2.30	4.67×10^5
2.	14.25	2.80	20.26	2.45	2.72×10^5
3.	17.35	2.23	15.35	1.23	5.12×10^5
4.	16.25	2.29	15.45	0.98	4.74×10^5
5.	17.15	2.60	16.60	3.45	5.45×10^5
6.	17.70	3.70	23.71	3.21	6.65×10^4
7.	14.00	2.20	43.80	2.02	5.60×10^5
8.	16.25	3.10	19.90	1.23	5.98×10^5
9.	16.85	3.34	41.50	2.56	4.59×10^5

TABLE III CHEMICAL AND BACTERIOLOGICAL QUALITY OF POMFRETS
IN RELATION TO DIFFERENT 'GRADES'.

(The values given in this table are the average values of 10 fishes.)

Grades	Total volatile nitrogen	Trimethyl amine nitrogen mg %	Alphaamino nitrogen	Thio barbituric acid No.	Total plate count count/g
I	14.5	1.6	17.0	1.02	4.51×10^4
II	14.5	1.6	15.7	0.98	4.76×10^4
III	15.7	2.8	16.1	2.09	5.60×10^5
IV	15.9	2.9	18.4	1.68	5.31×10^5
V	17.0	3.4	17.5	2.45	5.87×10^5

TABLE IV QUALITY OF POMFRETS TRANSPORTED FROM VERAVAL,
COLLECTED FROM DIFFERENT MARKETING CENTERS.

Sl. No.	Appearance of eyes	Colour of gills.	Colour of mucous	Organo-leptic grading.	TVN	TMA N mg%	Alpha amino N	Total plate count count/g
1.	Convex slightly dull	Red	White	Good	12.81	1.29	15.70	1.79×10^5
2.	Sunken opaque	Red	Red	Fair	14.53	2.64	19.08	4.16×10^5
3.	Sunken opaque	Reddish brown	Yellowish Red	Fair	13.85	1.92	16.70	1.93×10^5
4.	Convex bright	Red	Whitish yellow	Fair	12.98	2.67	18.56	9.34×10^5
5.	Convex bright	Red	White	Fair	12.37	2.05	16.97	2.24×10^5
6.	Flat slightly dull	Red	White	Good	12.62	1.26	17.55	1.01×10^5
7.	Sunken and opaque	Reddish brown	Reddish brown	Fair	15.50	2.59	19.90	2.92×10^5
8.	Bright convex	Red	White	Good	12.31	1.15	...	8.96×10^5
9.	Flat opaque	Red	Yellowish Red	Fair	13.02	2.17	...	1.63×10^5
10.	Sunken opaque	Red	Red	Fair	14.33	2.30	14.76	4.45×10^5
11.	Convex bright	Red	White	Good	13.16	1.34	16.23	4.68×10^5
12.	Flat opaque	Red	Red	Fair/poor	16.17	2.54	19.82	1.86×10^6

TABLE V KEEPING QUALITY OF POMFRETS TRANSPORTED FROM VERAVAL AT ROOM TEMP 29 + 2C

Period in hours	Appearance of eyes/skin	Colour of gills	Colour of mucous	TVN	TMA N mg%	Alpha amino N	Organo- leptic grading	Total Plate count count/g
Initial	Convex bright/shining with greyish scales.	Red	White	11.91	1.32	15.58	Very good	8.94X10 ⁴
2 hours	Flat slightly opaque/slightly dull greyish scales.	Red	Yellowish white	12.13	2.42	16.25	Good	1.82X10 ⁵
4 hours	Sunken opaque/reddish tinge to the skin	Reddish brown	Red	13.51	3.07	17.08	Fair
6 hours	—do—	do	Reddish brown	14.97	3.35	18.00	Fair
8 hours	Sunken opaque/skin dried appearance.	do	do	20.05	5.68	24.10	Fair/ poor	3.53X10 ⁵

TABLE VI ICE STORAGE CHARACTERISTICS OF POMFRETS TRANSPORTED FROM VERAVAL

Storage Period	TVN mg%	TMA N	Alpha amino N	Appearance of eyes	Colour of gills	Colour of mucous	Colour of skin	Organo- leptic grading
SERIES I								
Initial	18.05	2.72	11.60	Slightly convex, bright.	light red	light reddish yellow.	Shiny with greyish scales	Very fair
1 day	21.60	4.05	14.43	Flat opaque	Brown	Brown	Discoloured with a pale yellow slime	Fair
2 days	22.43	5.65	22.72	Sunken dull opaque	do	do	Covered with more slime	Fair
3 days	28.24	8.36	41.13	Sunken opaque	Dark brown	Dark brown	do (Acceptable to margin.)	Fair/poor
SERIES II								
Initial	13.45	1.35	12.04	Convex bright	light red	White	Shining with greyish scales	Good
1 day	17.77	2.73	13.65	Flat opaque	Red	Yellowish Red	Dull with grey scales	Very fair
2 days	18.60	3.73	16.04	Sunken opaque	Reddish brown	Reddish brown	Covered with Yellowish slime	Fair
4 days	21.67	7.20	29.63	do	do	do	do (Acceptable to margin.)	Fair/poor

As the repeated handling will reflect on the quality of fish, the quality of the pomfrets sold in different retail markets of Bombay are being sampled and the results are presented in Table 4. Rao and Perigrien (1964) have observed that mechanical vibrations and climatic conditions did not adversely effect the storage life of fish packed in ice by improved method, during railway transport. From the table it is seen that the fish with white mucous showed always less than 2mg of TMAN and the total plate count is generally low when compared with the fish of red mucous.

When the white mucous ones were allowed to spoil at room temperature $29^{\circ} \pm 2^{\circ}\text{C}$, a definite change in the colour of the mucous was noticed. By four hours spoilage, the white mucous changed definitely into red in colour with the increase in the spoilage indices, vide Table 5. The fish samples showed definite spoilage after 8 hours and were not in acceptable condition.

The storage characteristics of the pomfrets with white and red mucous stored in ice are given in Table 6. Venkataraman *et al.* (1967) have studied the storage characteristics of freshly caught silver pomfrets stored in ice and found that the freshly caught silver pomfrets were in good condition for a period of 14 days in properly iced condition. The results on the storage characteristics of the transported fish stored in ice showed that the samples were in good condition only for 2 days, as judged by physical, chemical and organoleptic tests. The initial quality of the transported fish reflects the three days storage of fresh pomfret in ice. These

results showed that the handling at different places and temperatures in the distribution chain has affected the storage life of the transported pomfrets. Experiments on the fish subjected to the fluctuating temperatures and further icing has considerably affected the keeping quality of fish in ice storage. (unpublished work). To study the colour changes in the mucous with respect to the chemical changes at low temperature, samples of transported pomfrets, having the same physical characteristics with white mucous, were stored in ice. From Table 6, it can be seen a slight increase in the TVN and TMA N values when the colour of the mucous was changed to red; the white mucous changed to red by one days storage in ice.

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