

Transportation of Fish - iii Biochemical Changes in Fish During Transportation in Insulated Containers

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The changes in the biochemistry of different varieties of iced fish during transportation in thermocole lined second hand teachests from Veraval to Bombay and Delhi are discussed. The moisture increased for all the varieties except for eel and hilsa at Bombay. TMAN and TVN increased in all cases. Maximum increase of TMAN and TVN was observed in seer fish.

In a large tropical country like India, where some of the potential fish consuming centres are thousands of kilometres away from the major fish landing centres, an effective system of handling and transportation is very essential. An extensive survey conducted by the Central Institute of Fisheries Technology, Cochin at the major fish consuming centres like Bombay and Delhi had revealed large variations in the quality of fish arriving in these markets (Anon, 1973).

A good knowledge of the biochemical changes that are taking place during transportation will help to develop suitable handling and transportation methods. The biochemical changes taking place in the case of frozen fish packed in insulated containers and stored at different temperatures have been studied previously (Perigreen, 1968), but very little is known about the biochemical changes taking place during transportation of iced fish. So this study was taken up under the "All India Co-ordinated Research Project on Transportation of Fresh Fish."

Materials and Methods

The container used was thermocole lined second hand tea-chests (Venkataraman *et al.*, 1976). Fish to ice ratio 1:1 was used. After packing, the boxes were des-

patched either to Bombay or Delhi in non-insulated rail wagons. The fishes used for the study included hilsa (*Hilsa ilisha* and *Hilsa toli*), silver pomfret (*Pampus argenteus*), black pomfret (*Parastromateus niger*), dhoma (*Otolithes sp.*), seer fish (*Scomberomorus guttatus*), eel (*Muroenesox cinereus*) and dai (*Chirocentrus dorab*). The biochemical analyses were carried out before despatch from Veraval and immediately after receipt at Bombay and Delhi. Moisture was estimated by the method of AOAC (1960) and trimethyl amino nitrogen (TMAN) and total volatile nitrogen (TVN) from the trichloroacetic acid extract by the method of Conway (1947).

Results and Discussion

Table 1 shows the average changes in the percentage of moisture in different varieties of fishes during transportation from Veraval to Bombay and Delhi. The percentage of moisture has gone up in almost all the varieties of fishes except in eel and hilsa despatched to Bombay. The average decrease in eel and hilsa was 0.65 and 1.11 respectively. But the percentages of moisture showed an increase for both these varieties at Delhi. This can be due to the prolonged contact with ice as the consignment took about 40 h to reach Delhi compared to 24 h to Bombay. At Bombay the minimum and maximum increase in the moisture were in cat fish and dai respectively while in Delhi minimum was for dhoma and maximum for pomfret. Both at Bombay

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and Delhi the TMAN showed increase during transportation, but it was more pronounced at Delhi (Table 2). This is also due to the longer time required for transportation. The highest increase of TMAN was in seer fish and the lowest in silver pomfret and hilsa. In all the cases the TVN registered an increase, the increase being more during transportation to Delhi (Table 3). As in TMAN, the highest increase in TVN was noticed in seer fish. This may be due to the soft muscle of the seer fish which is susceptible to quick spoilage.

Table 1. Average percentage changes in moisture for different varieties of fish during transportation from Veraval to Bombay and Delhi

Fish	Bombay	Delhi
Eel	— 0.65	+ 2.230
Silver pomfret	+ 1.14	+ 4.365
Black pomfret	+ 1.73	—
Dhoma	+ 1.39	+ 1.000
Dai	+ 1.97	+ 1.120
Hilsa	— 1.11	+ 2.934
Cat fish	+ 0.15	—
Seer	+ 0.42	+ 2.320
Ribbon fish	—	+ 2.200
<i>Lactarius</i>	—	+ 1.810
Prawn	—	+ 3.890

Table 2. Average values of TMAN (mg/100g)

Fish	Transportation to Bombay		Transportation to Delhi	
	Before despatch	After arrival	Before despatch	After arrival
Hilsa	1.420	1.559	1.510	2.302
Eel	1.585	1.618	2.028	2.586
Silver pomfret	0.825	1.004	0.680	2.331
Black pomfret	1.243	1.280	1.615	2.651
Dhoma	1.245	1.201	1.226	2.610
Perch	0.858	1.028	0.887	2.364
Seer	0.895	1.619	0.602	2.725
Dai	0.852	1.010	0.508	2.352
Cat fish	0.580	0.725	—	—

Table 3. Average values of TVN (mg/100g)

Fish	Transportation to Bombay		Transportation to Delhi	
	Before despatch	After arrival	Before despatch	After arrival
Hilsa	9.441	14.97	10.050	15.86
Eel	10.160	13.36	7.882	13.03
Silver pomfret	8.616	14.37	6.668	17.69
Black pomfret	9.550	15.26	11.460	14.02
Dhoma	12.420	14.34	8.570	17.84
Perch	9.943	15.12	11.990	15.01
Seer	12.130	21.96	10.110	27.57
Dai	9.302	13.13	8.845	17.50
Cat fish	11.040	14.94	—	—

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References

- Anon (1973) *Proc. ii Workshop. Indian Council of Agricultural Research Co-ordinated Research Project on Transportation of Fresh Fish and Utilisation of Trash Fish*. Mangalore, April 5-8 (Unpublished).
- AOAC (1960) *Official Methods of Analysis*. 9th edn., Association of Official Agricultural Chemists, Washington
- Conway, E. J. (1947) *Microdiffusion Analysis and Volumetric Error*. 5th edn., p. 199, Crosby Lockwood and Sons, London.
- Perigreen, P. A. (1968) *Fish. Technol.* 5, 43
- Venkataraman, R., Varma, P. R. G., Prabhu, P. V. & Valsan, A. P. (1976) *Fish. Technol.* 13, 41