Comparative Study of Traditional and Improved Containers for Transportation of Fresh Fish

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Traditional bomboo basket and expanded polystyrene insulated plywood box (second hand tea-chest) were compared for transportation of iced marine, fresh water and brackish water fishes from Kakinada to Madras by rail. Quality of fish at despatching and receiving centres was assessed by organoleptic, total volatile nitrogen (TVN) and total bacterial count (TBC) tests. Based on the results obtained and the prices fetched, the traditional bamboo basket apart from being cheaper was found to be as good as expanded polystyrene insulated plywood box for short distance transportation of iced fish involving less than 24 hours journey.

Fresh fish need to be transported from landing centres to distant markets not only to fetch remunerative price but also to make fish available to the people residing far away from landing centres. It is estimated that about 70% of the total fish catch in this country is utilised as fresh and about 50,000 tonnes of fish are annually transported by rail. Containers used for transportation of fresh fish in different parts of the country vary very much depending on the type of material available locally and the traditional practice in vogue. For instance in Maharashtra and Gujarat, second hand plywood boxes (used tea-chests) are used while in Andhra Pradesh and Tamilnadu, bamboo baskets lined with leaves and mats are extensively used.

In recent years, improved containers with expanded polystyrene insulated second hand tea chests (Anon, 1965; Venkataraman *et al.* 1976) and dismantlable galvanised iron boxes with expanded polystyrene insulation (Govindan & Gupta, 1978) have been developed. Among these the former is favoured and extensively tested. But the

main hurdles in its large scale use in Andhra Pradesh have been the non-availability of second hand plywood boxes of suitable capacity, high cost of plywood and insulants and the difficulty to get back the empty container and insulants for reuse. The present paper reports a comparative study of the traditional container and the improved insulated plywood box for transportation of fresh fish.

Materials and Methods

The traditional and improved containers were used simultaneously for transporting marine (eels, lesser sardines, *Hilsa keeli,* caranx, seer), fresh water (catla, rohu and mrigal) and brackish water fishes *(Chanos chanos)* from Kakinada to Madras by rail (about 700 km in 24 h). Traditional capacity bamboo baskets of 100 to 150 kg were lined with palmyrah mat and dry leaves spread at the bottom. Ice and fish were packed in alternate layers, fish to ice ratio of 1:1.5 was used in the initial consignments but based on observations, it was replaced by 1:1 in the later consignments. Dried leaves were again spread at the top of ice, the basket closed with its lid, wrapped with gunny cloth and securely stitched. Gunny

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cloth handles were provided for easy handling. The improved containers and the method of packing ice and fish were similar to those of Rao *et. al.* (1978). A few new plywood boxes of 120 kg capacity were also tried in some consignments. The fish to ice ratio of 1:1 was employed in all the improved containers.

The quality of the fish was assessed both at despatching and receiving centres by organoleptic, total volatile nitrogen (TVN), total bacterial count (TBC) and coliform counts. Total bacterial and coliform counts were determined by the standard methods employing total count agar and desoxy-cholate agar. Total voltatile nitrogen (TVN) was determined by Conway's micro-diffusion method (1947). The fish transported in both traditional and improved containers were marketed by the Tamilnadu Fisheries Corporation in Madras city.

Results and Discussion

All the consignments reached the destination in good condition and fetched the same price. Maximum price was fetched by seer fish (Rs. 10/kg) followed by catla, rohu and mrigal (Rs. 7/kg). The lowest priced was white baits (Rs. 1.50/kg). Eels fetched Rs. 4/kg and chanos Rs. 5/kg. The variety-wise and container-wise total bacterial counts are presented in Table 1, which reveals apparent differences in bacterial counts during transportation between containers as well as between different varieties of

fish. In sardines, the change in logarithmic TBC values during transportation in basket was + 1.0361 and for plywood box + 0.9722. The corresponding values in eels for baskets and box were — 0.4471 and — 0.2407 respectively. Thus there were apparent differences in change of bacterial counts during transportation. To find out whether these differences were significant along with the factor (s) responsible for these differences, a statistical analysis was carried out (Table 2).

The differences observed in TBC values in the single variable, such as station, variety and container were not significant. Among the various first order interactions, only the interaction of variety × station could produce significant differences (at 1 % level) in TBC values. None of the first order interactions involving change of container, produced significant difference in TBC values. The significant difference in TBC (at 1 % level) observed in second order interaction, variety × station × container can mainly be attributed to variety × station, which was the only first order interaction producing a significant difference in TBC values. Thus based on TBC values there was no significant difference in change of the bacteriological quality of fish transported by traditional and improved containers. Chattopadhyay & Bose (1978) also observed fair bacteriological standard of fish transported in bamboo basket. The significance (p< 0.01) of the variety × station means that the TBC values were different

Table 1. *Total bacterial counts of fish at despatching and receiving centres*

Fish	At Kakinada	At Madras		Pooled values at Madras	Increase/ decrease %
		T*	I**		
Sardine *(Sardinella albella)*	3.5618	4.5979	4.5340	4.5660	+ 28.19
Catla	3.4968	4.3961	3.9155	4.1558	+ 18.85
Chanos	4.1308	4.0277	4.2659	4.1468	+ 0.39
Seer	3.7413	3.5567	3.8908	3.7238	— 0.46
White baits	4.4132	4.0836	4.1726	4.1281	— 6.49
Eel	4.2867	3.8396	4.0460	3.9428	— 8.02

T*— Traditional container
I**— Improved container

Table 2. *Analysis of variance for total bacterial counts*

Source	S.S.	df	M.S.	F
Between stations	0.5342	1	0.5342	<1
Between varieties	2.4951	5	0.4990	<1
Error (a)	4.3958	5	0.8791	
Between containers	0.0131	1	0.0131	<1
Variety × container	0.3275	5	0.0655	<1
Variety × station	4.3953	5	0.8791	6.99**
Station × container	0.0122	1	0.0122	<1
Variety × station × container	5.0625	5	1.0125	8.06**
Error	6.0288	48	0.1256	
Total	18.8686	71		

** Significant at 1 % level

Table 3. *Total volatile nitrogen values of fish at despatching and receiving centres–mean values (log)*

	At Kakinada	At Madras		Pooled mean at Madras	Increase/ decrease %
		T*	I**		
White baits	0.7347	1.1847	1.4179	1.3013	+77.2
Sardine *(Sardinella albella)*	0.7195	1.0931	1.2773	1.1852	+64.7
Chanos	0.5396	0.7702	0.7747	0.7724	+43.2
Seer	0.8198	1.0055	0.9705	0.9880	+20.5
Catla	0.9695	1.2059	1.1580	1.1819	+19.4
Eels	0.8938	0.8993	0.7902	0.8448	— 5.5

T* — Traditional container
I** — Improved container

Table 4. *Particulars of meltage of ice during transportation*

Container	Number of observations	Fish: ice ratio	Ice left over (%) Mean ± S.D.
Improved	18	1:1	46.4 ± 14.9
Traditional	5	1:1	23.6 ± 4.1
Traditional	17	1:1.5	24.5 ± 9.9

among varieties between the two stations. Thus significant differences in quality during transportation were noticed in different fishes in this study indicating that certain fishes are more suitable for transportation. None of the consignments revealed coliforms at despatching and receiving centres. The TVN values are given in Table 3. There was no significant difference in TVN values of fish transported in the two types of con-tainers, but significant differences were noticed in TVN values among different varieties of fishes during transportation indicating that both the types of containers were equally good.

The details of fish to ice ratio at the trans-porting centre (container-wise) and the ice left over at the destination (in percentages) are presented in Table 4. The percentage

Table 5. *Cost details of traditional and improved containers*

Traditional	Rs.	Ps.	Improved	Rs.	Ps.	Improved	Rs.	Ps.
Bamboo basket, 150 kg capacity	5	00	Plywood box, 120 kg capacity	48	00	Second hand tea chest, 45 kg capacity	3	50
Palmirah mat	3	20	Expanded polystyrene (25 mm, 58.5 x 48.2 x 48.2 cm)	46	00	*Expanded polystyrene calculated for one trip	9	75
Badam leaves	0	50	Polythene sheet	6	00	Polythene sheet	3	45
Gunny, sutli (country twine) etc.	5	00	Gunny, coir rope, sutli (country twine), nails etc.	5	00	Gunny, rope, sutli, nails etc.	3	25
Total	13	70				Total	19	95
Say Rs. 14, for transporting 60 kgs of fish			Cost of gunny, polythene, rope sutli, nails etc. for 2 additional trips	22	00	Cost for transporting 22 kg fish in second hand teachest insulated container	19	95
Cost per kg fish	00	24	Return freight for the empty containers and insulation for three trips	9	00	Cost per kg fish	00	90
			Disinfectant	1	00			
			Total	137	00			
			This new container along with insulation can be used for three trips.					
			Cost for 3 trips	137	00			
			Cost for 1 trip	45	60			
			Cost for transporting 60 kg fish in improved container	45	60			
			Cost per kg of fish	00	76			
			*Expanded polystyrene insulation can be used for 3 trips					

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left over of ice was more at the destination in improved containers, when compared to the baskets indicating better insulation in improved container. Sufficient quantities of left over ice was noticed in baskets which was found sufficient for unexpected delays in transit. 1:1 fish to ice ratio was found to be adequate even in the traditional container for transhipment from Kakinada to Madras in 24 h.

The packing cost of the traditional and improved containers are presented in Table 5. The packing charges per kg of fish for traditional container was 0.24 rupees per kg while that of used tea chests and newly fabricated plywood boxes were 0.90 and 0.76 rupees respectively. The traditional bamboo basket performed equally well as those of insulated boxes during tranship- ment of fish from Kakinada to Madras by rail involving 24 hours journey. It may be worth while to study the comparative effi- ciency of these containers for long distance rail transportation such as from Madras to Howrah.

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