

Extension of Shelf-life in Ice of Three Species of Fish by Pre-chilling in Ice-Seawater Slurry

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Abstract: The influence of pre-chilling in ice-seawater slurry on storage life on ice of *Upeneus moluccensis*, *Trichiurus savala* and *Saurida tumbil* was studied. In comparison to a storage life on ice of 12, 7 and 5 days for control *U. moluccensis*, *T. savala* and *S. tumbil* samples, ice-seawater pre-chilled fish gave a shelf-life of 14, 9 and 7 days respectively, suggesting a shelf-life extension of two days by the treatment. The shelf-life was assessed by Intellectron Fish Tester and sensory evaluation.

Introduction

Ice-seawater slurry is used to chill fish on board (Chapman, 1990; Anon, 1992; Bibi, 1993; "DOS"O' Sullivan, 1993). When the fish is chilled, it is taken back and stored in ice or in other chilling medium. The rate of chilling of fish in ice-seawater slurry is faster than that in ice (Chapman, 1990; Thomas, 1992; Thomas *et al.*, 1994). This paper reports the influence of chilling the fish in ice-seawater slurry before icing on the shelf-lives of *Upeneus moluccensis*, *Trichiurus savala* and *Saurida tumbil*.

Materials and Methods

The studies were conducted onboard FORV Sagar Sampada during September-October 1994. *Upeneus moluccensis*, *Trichiurus savala* and *Saurida tumbil* were collected from trawl catches. Immediately after unloading the catch was washed well using seawater and sorted species-wise and size-wise. Sufficient numbers of these three fish species of uniform size (Av. wt. 76, 408 and 145 g, respectively) were iced in the ratio 1:2 (fish:ice) by weight (control) and stored in polystyrene box of wall thickness 3 cm. Flake ice was used for

icing. An ice-seawater slurry was prepared by mixing flake ice and clean seawater in the ratio 3:1 (Chapman, 1990). Sufficient numbers of these three species of the same size as in the case of control were immersed in the ice-seawater slurry till the core temperature reached 0°C as measured by Freezer Temperature Monitor (Ramakrishnan *et al.*, 1982). Then these fishes were taken back from the slurry (treated). Icing and storing of pre-chilled fishes were carried out as in the case of control. Both control and treated samples were reiced during storage. Ten numbers each of these three fishes from control and treated samples were drawn at intervals and assessed for quality by Intellectron Fish Tester VI and by sensory methods.

Results

Intellectron readings and changes in the sensory characteristics of *U. moluccensis* (control) and those of pre-chilled *U. moluccensis* (treated) during storage in ice are given in Table 1. It is seen from the Table that the shelf-lives in ice of control and treated samples are 12 and 14 days respectively. Thus the shelf-life in ice of *U. moluccensis* can be

Table 1. Intellectron Fish Tester VI readings and changes in the sensory characteristics of pre-chilled *Upeneus moluccensis* during storage in ice

Period of storage (days)	Control (c)/ Pre-chilled(p)		Intellectron readings				Sensory characteristics			Appearance
			Eyes	Gills	Texture					
0	C		43.6	Convex clear	Characteristic colour and odour	Very firm	Characteristic bright colour			
2	P		43.6	"	"	"	"			
	C		25.4	Convex slightly turbid	"	"	"			
4	P		28.8	Convex slightly turbid	"	"	"			
	C		24.4	"	Slightly pale, slight fishy odour	Firm, finger impression disappears quickly	Slight leaching of colour			
6	P		24.0	Convex slightly turbid	"	"	"			
	C		23.0	Flat turbid	"	"	Leaching of colour Red colour almost leached.			
8	P		20.0	"	"	"	"			
	C		17.5	"	Slightly pale, fishy odour	"	Leaching of colour, red colour leached completely			
10	P		16.7	"	"	"	"			
	C		15.0	Flat turbid	Slightly pale, fishy odour	Soft, finger impression disappears slowly	Leaching of colour, red colour leached completely			
12	P		16.0	"	"	"	"			
	C		14.3	"	"	Firm, finger impression disappears quickly	"			
14	P		15.5	"	"	Soft, finger impression disappears slowly	"			
	C		12.9	Sunken turbid	Pale, spoiled odour	Soft, permanent impressions	"			
16	P		15.6	Flat turbid	Pale, fishy odour	Soft, finger impression disappears slowly	"			
	P		14.4	Sunken turbid	Pale, spoiled odour	Soft, permanent impression	"			

Table 2. Intellectron Fish Tester VI readings and changes in the sensory characteristics of pre-chilled *Trichiurus savaia* during storage in ice

Period of storage (days)	Control (c)/ Pre-chilled(p)		Sensory characteristics			
	Intellectron readings	Eyes	Gills	Texture	Appearance	
0	C	Convex clear	Characteristic colour and odour	Very firm	Characteristic bright colour	
2	P	"	"	"	"	
	C	Convex slightly turbid	"	"	"	
3	P	Convex clear	"	"	"	
	C	Convex turbid	Slightly pale fishy odour	"	Slight leaching of colour, silvery colour was removed from certain parts	
5	P	Convex slightly turbid	"	"	"	
	C	Convex turbid	"	Firm, thumb impression disappeared quickly	"	
7	P	"	"	Very firm	"	
	C	Flat turbid	Slightly pale, fishy odour	Firm, thumb impression disappears quickly	Leaching of colour silvery colour removed from certain parts	
9	P	Convex, turbid	"	"	"	
	C	Sunken turbid	Pale, spoiled odour	Soft thumb impression disappeared	"	
11	P	Flat turbid	Slightly pale fishy odour	slowly	"	
	C	Sunken turbid	Pale, spoiled colour	Soft permanent impression	"	
	P	"	"	"	"	

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Table 3. Intellectron Fish Tester VI readings and changes in the sensory characteristics of pre-chilled *Saurida tumbil* during storage in ice

Period of storage (days)	Control (c)/ Pre-chilled(p)		Sensory characteristics				Appearance
	Intellectron readings	Eyes	Gills	Texture	Appearance		
0	C	46.8	Convex clear	Dark brown characteristic odour	Very firm	Characteristic bright colour	
1	P	46.8	"	"	"	"	
	C	39.0	"	"	"	"	
	P	31.3	"	"	"	"	
3	C	22.5	Convex turbid	Slightly pale, fishy odour	Firm, thumb impression disappears quickly	Slight leaching of colour	
	P	20.2	Convex slightly turbid	Slightly pale slightly fishy odour	"	"	
5	C	17.9	Flat turbid	"	Soft, impression disappears slowly	Slight reddish tinge leaching of colour	
	P	19.3	"	Pale, fishy odour	"	Leaching of colour	
7	C	11.4	Sunken turbid	Pale, spoiled odour	Soft, permanent impression	Slight reddish tinge, leaching of colour	
	P	15.6	Flat turbid	Pale, fishy odour	Soft impression disappears slowly	"	
9	C	10.9	Sunken turbid	Pale, spoiled odour	Soft permanent impression	"	
	P	14.1	"	"	"	"	

extended by 2 days by pre-chilling to 0°C by ice-seawater slurry. From the Table it is also seen that the Intelectron reading of *U. moluccensis* decreased from 43.6 during storage in ice and finally it reached 13-14, when both of the samples became unacceptable.

The Intelectron readings and changes in the sensory characteristics of *T. savala* of both control and treated samples are given in Table 2. From the Table it is seen that the shelf-lives on ice of *T. savala* and pre-chilled *T. savala* are 7 and 9 days respectively. In this case too the extension of shelf-life on ice was 2 days. The Intelectron reading of *T. savala* decreased to 36-41, when both control and treated samples became unacceptable.

It is seen from Table 3 that the shelf-life on ice of *S.tumbil* was extended from 5 days to 7 days by pre-chilling in ice-seawater slurry. The Intelectron reading of the fish decreased from 46.8 during storage on ice and finally it reached 11-14, when both of the samples became unacceptable.

Discussion

Durairaj and Krishnamurthi (1986) reported that when pre-chilled in a

mixture of ice and water and then iced, *Labeo rohita* showed a shelf-life of 9 days compared to 7 days when iced directly. This observation is similar to those recorded by the authors. The extension of shelf-life may be due to the following reasons. (1) During pre-chilling by ice-seawater slurry the rate of chilling is faster than that during icing (Chapman, 1990., Thomas *et al.*, 1994) (2) During pre-chilling the core temperature is dropped to 0°C, while during icing the core temperature never attains 0°C (Chapman, 1990, Thomas *et al.*, 1994). Consequently, the shelf-life on ice of the pre-chilled fish is extended.

Thus, it is concluded that shelf-life on ice of fish can be extended by chilling the fish in ice-seawater slurry before icing.

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