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**Ketul Patel**

College of Fisheries Science,  
Junagadh Agricultural  
University, Veraval, Gujarat,  
India

**NK Suyani**

College of Fisheries Science,  
Junagadh Agricultural  
University, Veraval, Gujarat,  
India

**GJ Patel**

College of Fisheries Science,  
Junagadh Agricultural  
University, Veraval, Gujarat,  
India

**Corresponding Author:****NK Suyani**

College of Fisheries Science,  
Junagadh Agricultural  
University, Veraval, Gujarat,  
India

## Quality assessment of Indian mackerel (*Rastrelliger kanagurta*) stored in ice

**Ketul Patel, NK Suyani and GJ Patel**

**Abstract**

Study was conducted to assess the changes in the quality of Indian mackerel (*Rastrelliger kanagurta*) with and without covering of polyethylene bag during ice storage for 3 days. Results indicated that fish preserved under ice without polyethylene covering were spoiled at the end of 3<sup>rd</sup> day of preservation and lose its freshness and sensory quality attributes. On the other hand fish preserved under ice with covering of polyethylene bag showed significantly higher freshness values and good acceptable sensory quality attributes. Torrymeter values indicated the excellent results for polyethylene covered fish during ice storage. With this results, we can suggest that covering of polyethylene bag prior to chilling can be an excellent and alternative method of fish preservation, which will increase the shelf life of fish which can be sold for longer period of time.

**Keywords:** Indian mackerel, ice, polyethylene, shelf life, torrymeter

**1. Introduction**

The Indian mackerel, *Rastrelliger kanagurta* (Cuvier, 1817) is a small pelagic schooling scombroid fish widely distributed in the Indian Ocean and Indo- West Pacific region [1]. It is considered as the national fish of India. The total landings of Indian mackerel in 2018 was 2.84 lakh contributing 8.1% to the total marine fish landings of India [2]. Freshness determines the quality of fish as food, both for those to be used in home cooking and those to be commercially processed [3]. Nature of the fish species and handling and storage conditions determines the quality of fish. Microbiological, biochemical, and sensory methods have been used to assess the freshness and quality of fish during handling and storage. The use of ice is possibly the simplest method of preserving the fish catch and benefits of ice usage in the tropics are perhaps even greater than in the colder zone. It is a fact that fresh fish that has been well handled and kept at low temperatures exhibit reduced bacterial growth [4]. The effects of aluminum foil and cling film on sensory quality of *Dicentrarchus labrax* was studied in which cling film showed advantageous results in terms of sensory and microbiological quality [5]. Several studies of preservation of fish and shrimps using chemicals have been carried out by different researchers [6, 7], but there is little information about Indian mackerel on the shelf life and freshness quality during ice storage. Thus the aim of this study was to determine the freshness and sensory quality differences between fish samples stored directly in ice and samples packed in polyethylene bag and then stored in ice.

**2. Materials and Methods****2.1 Sample preparation**

The present study was conducted at College of Fisheries Science, Junagadh Agricultural University, Veraval, Gujarat, India in the year 2018. Initially, 2 Kg large size (150-200 g/fish) Indian mackerel (*Rastrelliger kanagurta*) was purchased from Kharakuwa fish market located near Veraval, Gujarat, India. Fishes were caught using trawl net operated through IBM trawlers. Then fishes were brought to the laboratory and cleaned & washed properly with the tap water for several times, then divided into two equal groups and immediately cooled on ice before being treated in different ice boxes. The mean and standard deviations of the weight and total length of the fish studied were  $175.3 \pm 10.99$  g and  $22.5 \pm 1.97$  cm, respectively. Fishes were divided into 2 groups, one group of samples was preserved directly in ice without polyethylene bag (Treatment 1 – T1) and another group of samples was packed in polyethylene bag of 200 gauge (Treatment 2 – T2) and kept in thermocol insulated box containing ice. After that boxes were kept at room temperature for further analysis. Samples were analyzed daily up-to 3 days.

**Table 1:** Flow chart of experiment

Raw material	
▼	
Washing & Weighing	
▼	
Separate the fish	
□	
<b>Treatment 1</b>	<b>Treatment 2</b>
Fish without polyethylene bag	Fish covered with polyethylene bag
Stored in thermocol insulated box	

## 2.2 Analytical methods

Indian mackerel fish samples were analyzed before chilling (zero day), after 1 day, 2 days and 3 days of storage for their freshness and sensory evaluation. Freshness of fish was determined using instrumental method and Quality Index Method (QIM).

### a) Instrumental method for assessing fish quality: Freshness meter: (Table 2)

Freshness of fish was assessed by recording the electrical resistance of skin and muscle flesh by using the Distell fish freshness meter, which has been developed at Torry Research Station (U.K.) known as Torrymeter. Readings were taken by placing the base of the meter firmly on the fish so that it lies flat against the surface and parallel to the lateral line at a thick, fleshy part of the fish. Distell fish freshness meter has reading from 0 to 16. In this meter, highest value (16) is obtained for very fresh and the reading decrease with spoilage

of fish.

**Table 2:** Freshness meter score sheet

Raw odor description	Freshness meter score	State of spoilage
Fresh sea weedy odor	16	Very fresh
Shellfish odors and loss of fresh sea weediness	14	↓
No odors, natural odors	13	
Slightly musty, mousy, milky or caprylic, garlic, peppery	11	
Bread, malt, beer, yeasty odors	10	
Lactic acid, sour milk, or oily odors	8	↓
Grass, old boots, slightly sweet, fruity or chloroform-like odors	7	
Stale cabbage water, turnip, sour sink, wet matches, phosphine like odors	5	↓
Ammonia, strong "byre-like" odors	<3	
Strong ammonia, bad eggs (hydrogen sulphide)	<3	
Putrid, sulphides	<3	Putrid

Organoleptic charts for commercial fish species <sup>[8]</sup>.

### b) Sensory evaluation by quality index method (QIM)

During the sensory evaluation of fish freshness, fish samples were evaluated at each time of sampling by three expert panelists. The Quality Index Method (QIM) developed by Larsen *et al.* <sup>[9]</sup> was used in this study. QIM gives scores of zero for very fresh fish and scores increases with spoilage of fish (Table 3).

**Table 3:** Quality Index Method (QIM) score sheet

Quality parameter	Character	Score (ice/seawater)
General Appearance	Skin	0 Bright, Shining
		1 Bright
		2 Dull
	Bloodspot on gill cover	0 None
		1 Small, 10-30%
		2 Big, 30-50%
		3 Very Big, 50-100%
	Stiffness	0 Stiff, in rigor mortis
		1 Elastic
		2 Firm
		3 Soft
	Belly	0 Firm
		1 Belly burst
	Smell	0 Fresh, seaweed/metallic
		1 Neutral
		2 Musty/sour
		3 Stale meat/rancid
Eyes	Clarity	0 Clear
		1 Cloudy
	Shape	0 Normal
		1 Plain
		2 Sunken
Gills	Colour	0 Characteristic, red
		1 Faded, discolored
	Smell	0 Fresh, seaweed/metallic
		1 Neutral
		2 Sweaty/slightly rancid
		3 Sour stink/stale rancid
Sum of scores		(Min. 0 and Max. 20)

Quality assessment scheme used to identify the quality index demerit score <sup>[9]</sup>.

## 2.3 Statistical analysis

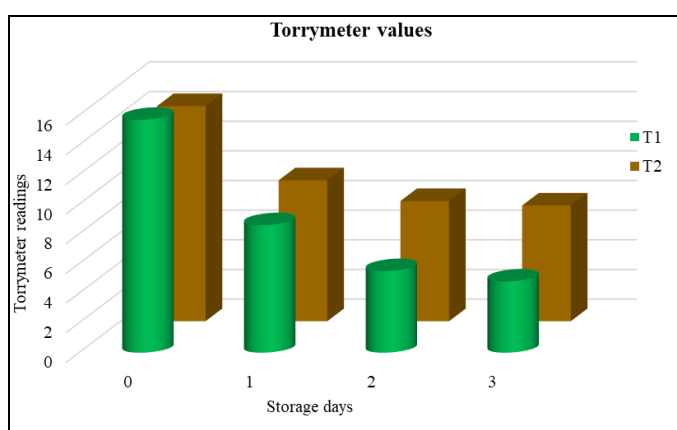
All the statistical analysis were performed under Microsoft Excel Ver. 2013.

## 3. Results and Discussions

### 3.1 Freshness assessment

A decrease in Torrymeter readings for T1 and T2 from 0 day

to 3<sup>rd</sup> day was observed as shown in Fig. 1. Initial values of fish samples for T1 and T2 were 15.7 and 14.5 respectively. The highest rate of decrease in Torrymeter values was obtained in fish preserved without polyethylene bag (T1) i.e. from 8.6 (1<sup>st</sup> day) to 4.8 (3<sup>rd</sup> day). The same result was observed for fish preserved under crushed ice for torpedo scad fish samples [10]. In case of fish preserved with polyethylene bag (T2) torrymeter values decreased from 9.5 (1<sup>st</sup> day) to 7.8 (3<sup>rd</sup> day). Thus it shows that there is not much difference in the values and indicates that fish preserved after packaging with polyethylene bag shows high freshness quality compared to fish directly preserved in ice. Also fish preserved without any covering shows that the fishes were spoiled in 2 days whereas in case of fish packed with polyethylene bag were still in good condition.



**Fig 1:** Torrymeter values of Indian mackerel for treatment – 1 and treatment – 2 during storage

### 3.2 Sensory evaluation

Freshness scores of fish samples before storage and after 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> day of storage attributed by panelists for T1 and T2 during the storage are shown in Table 4. Sensory analysis is concerned with measuring physical properties by psychological techniques [11]. It is observed that sensory scores of fish samples on day 1 to day 3 varied from excellent and very good to moderate in case of T2, while in case of T1 scores increases from  $2.96 \pm 0.11$  to  $13.53 \pm 0.45$  which clearly indicates that the fish has spoiled which was preserved directly under ice without any packaging. The same changes were observed in torpedo scad samples stored under crushed ice which is due to the melting of the ice [10]. Thus there is a significant difference in the scores of T1 and T2. QIM scores for different marine fishes landed by single and multi day fishing vessels were reported in the range of 2.09 to 9.00 [12].

**Table 4:** QIM sensory panel scores of T1 and T2.

Storage days	T1	T2
0	$2.96 \pm 0.11$	$3.10 \pm 0.10$
1	$5.00 \pm 0.10$	$4.70 \pm 0.13$
2	$11.33 \pm 0.66$	$8.03 \pm 0.35$
3	$13.53 \pm 0.45$	$9.23 \pm 0.58$

### 4. Conclusion

From the results it is apparent that the use of polyethylene bag for covering fish during ice storage shows good results in terms of freshness and sensory attributes. It helps in the maintenance of the physical attributes and quality of seafood proteins. Fish preserved after covering with polyethylene bag showed higher shelf life compared to fish directly under ice.

Also QIM scores showed a good results in treatment 2 compared to treatment 1. Thus introduction of single polyethylene bag for covering the fishes during ice storage can increase the quality of fish by preserving the fish for a longer period of time.

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