QUALITY OF FRESH FISH IN THE MARKETS OF BOGOR AND JAKARTA

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Introduction

Maintaining quality of fish, shellfish, and other seafood products begins with harvest and carries through the distribution systems. Careful and appropriate handling of seafood products during the distribution system is essential if high quality products are to be available to the consumer. The type of care needed to maintain quality is largely dependent upon characteristics of the product.

Deterioration of seafood products is mainly due to microbial, chemical, and physical processes. Bacteria are present in skin, gills, and viscera of fish and shellfish and eventually enter and attack the flesh. The final result of the bacterial activity is a spoiled product. Chemical deterioration is due to oxidative and enzymatic reactions, which eventually result in the formation of off-flavor and rancidity. Enzymes present in fish meat are the cause of autolysis upon death of the animal. Physical factors enhancing the breakdown are mostly environmental and affect the rate of deterioration indirectly, primarily through accelerating bacterial and/or chemical processes. Control of the deterioration rate is the objective of quality maintenance activities. Many variables influence the loss rate of quality (Magnusson and Martinsdottir, 1995; Roura and Crupkin, 1995).

Indonesia has a vast coastal area, which eventually provides rich and natural resources. Fish is one of the most important animal protein sources for the diet of people in Indonesia. However, the utilization of fish and shellfish has not relatively developed in Indonesia not only because of the low exploitation of fisheries resources but also the inadequate and ineffective distribution systems. Seafood products harvested are usually transported without ice or with small amount of ice in Indonesia. Therefore, the quality or freshness of seafoods lowers fairly fast and people have to boil or fry them prior to consumption.

In this report, the authors have made the investigation on the quality of fresh fish sold in the markets of Indonesia. The aim of this study is to elucidate how the fish quality decreases during the distribution system in Indonesia, so an improved procedure for the distribution of fresh fish would be suggested from the standpoint of food safety and hygiene.

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This study was conducted as a part of collaborative research work under OECF-LOAN and some of equipment used in this study were installed by OECF. During this collaborative study, equipment such as HPLC worked properly; and some instruments and reagents which could not obtained in Indonesia were donated from Tokyo University of Fisheries for pursuing this study.

MATERIALS AND METHODS

Samples

Mackerel *Euthynnus affinis* (tongkol in Indonesian), short bodied mackerel *Decapterus ruselli* (Kembung layang in Indonesian), short bodied mackerel *Selar crumenophthalmus* (Kembung Bentrong in Indonesian), short bodied mackrel *Scomber neglectus* (Kembung Perempuan in Indonesian), mullet *Mugil dussimieri* belanak in Indonesian), tuna fillet (species unkown), and red snepper *Lates calcalifer* (Kakap Merah in Indonesian) were purchase either from local fish markets or from supermarkets in Bogor and Jakarta on December 23 and 24, 1994.

The prices of samples were recorded and managers in charge of fish section were interviewed in order to figure out how those samples were distributed from the harvest.

Determination of Fish Freshness

K value was used as an index of fish freshness in this study. K value of samples right after the purchase at each market was measured by the Freshness Test Paper III (EAC Freshness Testing System, EAC Corp., Tokyo, Japan). K value was also determined by the HPLC technique in the laboratory of IPB. ATP-related compounds were extracted with 10% perchloric acid.

After neutralization with KOH, ATP-related compounds were determined by the HPLC method as described by Ryder (1985). A Shimadzu Associates Model LC-8A liquid chromatograph equiped with a Model C-R5A Chromatopac, a Model SCL-8A System Controller, and a Model SPD-6A UV Spectrophotometric Detector was used for all analyses. Separations were achieved on a reverse-phase Chemcosorb 7-) DS-L (4.6 x 300 mm, Chemcopak Liquid chromatography column, Chemco Scientific Co., Ltd). The mobile phase of 0.04M potassium dihyrogen orthophosphate and 0.06M dipotassium hydrogen orthophosphate was employed at a flow rate of 1.0 ml/min. The eluent was monitored at 254nm with full scale reponse for each of the six ATP-related compounds.

RESULTS

Local Fish Market "Ramayana" in Bogor

Mackerel, Kembung Layang, and Kembung Bentrong were purchased and heir K values were determined by the test paper method. Those fish were caught at Java Sea and landed at Cirebon port. Then they were transported in ice boxes to Bogor through Bandung (2 hours from Cirebon). It took usually about 3 hours from Bandung to Bogor.

The price of each sample fish was Rp (Rupiah) 3,00/kg. K values were 29, 31, and 31% for mackerel, Kembung Layang, and Kembung Bentrong, respectively.

Local Fish Market "Bogor" in Bogor

Mackerel, Kembung Layang, and Kembung Bentrong were obtained with the prices of Rp 4,000, 2,500, and 3,500/kg, respectively. Mackerel transported to Bogor from Cirebon port through Bandung had K value of 33%. On the other hand, K value of mackerel from Muara Baru port in Jakarta were 25%. Both Kembung Layang and Kembung Bentrong were distributed from Cirebon port through Bandung with K value of 31%.

"Hero" Supermarket in Bogor

Mackerel (Rp 4,500/kg), Kembung Perempuan (Rp 4,000/kg), and mullet (Rp 4,850/kg) were from Jakarta, distributed from the center of this supermarket at Jakarta. Since all fish in this supermarket are brought from Jakarta only once a week (every Wednesday), sale price of fish changes during a week. All fish were placed in or on ice in the showcases of the store. K values of mackerel, Kembung Perempuan, and mullet were 31%, 47%, and 82%, respectively. Odor of mullet was asfully bad.

"Hero" Supermarket at Sarinah Store in Jakarta

Mackerel, Kembung Perempuan, and mullet were purchased at the prices of Rp 4,500, 4,500, and 4,850/kg. Those fish were also received from the center of this supermarket. The suplier of fish to this center was "Samudera Supplier".

K value of mackerel was determined to be 35%, Kembung Perempuan 42%, and mullet 70%. The odor of mullet sensorly evaluated was terrible.

"Gelael" Supermarket in Jakarta

Local Market "Pasar Minggu" in Jakarta

Two kinds of mackerel (one from Java Sea and one from Indian Ocean) and Kembung Bentrong were obtained in this market. Mackerel caught at Java Sea were landed at 2:00 AM of December 24 at Cilincing port and transported in water with some ice to the market at 5:00 AM according to the manager of the market. K value was determined to be 33% at 9:00 AM (Rp 3,500/kg). On the other hand, mackerel from Indian Ocean were landed at Pelabuhan Ratu at 11.00 PM of December 23 and distributed trough Bogor (1:00 AM of December 24) to Jakarta (3:00 AM) by storing in ice boxes. K value was 31% at 9:00 AM (Rp 2,500/kg).

Kembung Bentrong (Rp 3,000/kg) was distributed together with mackerel which were landed at Cilincing port. K value was 31%.

DISCUSSION

Results of the study (price and K value by test paper) are summerized together with K value determined by the HPLC method in Table 1.

Mackerel

Mackerel is one of the most popular fish species utilized in Indonesia. Price of mackerel was somewhere between Rp 2,500 and 5,000/kg. On the other hand, K value was in the range of 20-35% by the test paper and 28-65% by the HPLC technique. Most of mackerel used in this study were caught in Java Sea, but the freshness and price were not much different between in Bogor and in Jakarta. Although K values of mackerel varied with the method employed to determine, it appears on the whole that the price of mackerel does not necessarily correlate with its quality (freshness) in Indonesia.

Mackerel purchased from local market "Pasar Minggu" in Jakarta was landed at Cilincing port at 2:00 AM and transferred to the market at 5:00 AM, but K value was already 33% at 9:00 AM. It was due to the poor control of freshness, for instance only small amount of ice was used and the quality of soaked water was very bad and dirty. They put all fish in the same water with some ice without changing water during distribution system. The awareness and knowledge of sanitation, food safety, and hygiene concerning fresh fish are lacking, though they know the purpose of using ice during fish transportation. This is the typical incident observed in Indonesia.

Short Bodied Mackerel

Four different species of short bodied mackerel were puchased and their quality was determined (Tabel 1). K values of short bodied mackerel were between 31 and 47 by test paper method and between 20 and 56 by HPLC method. Variation of K value between test paper method and HPLC Method was relatively small compared to that of mackerel. The highest price of short bodied mackerel was Rp 5,000/kg and the lowest was Rp 2,000/kg. Again, the price of short bodied mackerel was not determined by their quality. The way how they distributed short bodied mackerel (for instance the amount of ice) playied an important role to keep freshness. It seemed that in general local markets handled short bodied mackerel at lower prices with high quality compared to supermarkets.

Mullet

Although mullet were relatively expensive fish, their K values were very large, somewhere between 45 and 95 (Tabele 1). Mullet had apparent deteriorative odor and appeared to be inedible. Only supermarkets were carrying mullet during this study. It is hard to understand that mullet with this quality are on the market with this price.

Others

Tuna fillets obtained in Jakarta had K values of 32 to 36 (Table 1), were not suitable for the preparation of sashimi or sushi but still good for cooking. Since the price was fairly high, most of the consumers were foreigners. On the other hand, red snapper was more expensive than tuna and had lower freshness than tuna. Those fish were too expensive for most of Indonesian people to buy.

CONCLUSION

Freshness of mackerel and short bodied mackerel was relatively good, but that of mullet was very poor. Prices of fish sold in the markets of Bogor and Jakarta were, on the whole, not correlated with their quality such as freshness. It has been suggested especially for people in tropical areas to use large amount of ice to maintain fish freshness during transportation and storage.

Although most people in Indonesia seem to have some awareness and knowledge of sanitation and food safety, they tend to use less amount of ice than necessary because of the price of ice and its availability. In near future, more ice-making machines are needed to reduce the price of ice in the distribution of fresh fish. Furthermore, education about food hygiene and food safety is required to people in Indonesia.

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Freshness test papers are convenient to use, but there were some variations in K values determined by this method and HPLC method, especially for mackerel. Fig. 2 presents the correlation of K values between the test paper method and HPLC method.

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Table 1. List of price and K value of sample fish used

No	Species of Fish	Location	Price (Rp/kg)	K Value	
				Test Paper	HPLC
1	Mackerel	Local market in Bogor	3,000	29	52
2	Mackerel	Local market in Bogor	4,000	33	61
3	Mackerel	Local market in Bogor	4,000	25	27
4	Mackerel	Local market in Bogor	4,500	31	64
5	Mackerel	Local market in Jakarta	3,500	33	47
6	Mackerel	Local market in Jakarta	2,500	31	43
7	Mackerel	Local market in Jakarta	4,500	35	49
8	Mackerel	Local market in Jakarta	5,000	29	28
9	Mackerel	Local market in Jakarta	5,000	23	41
10	Short bodied mackerel	Local market in Bogor	3,000	31	20
11	Short bodied mackerel	Local market in Bogor	2,500	31	29
12	Short bodied mackerel	Local market in Bogor	3,000	31	30
13	Short bodied mackerel	Local market in Bogor	3,500	31	24
14	Short bodied mackerel	Local market in Jakarta	3,000	31	27
15	Short bodied mackerel	Super market in Bogor	4,500	47	57
16	Short bodied mackerel	Super market in Jakarta	4,500	42	52
17	Short bodied mackerel	Super market in Jakarta	5000	31	21
18	Short bodied mackerel	Super market in Jakarta	4,500	33	33
19	Mullet	Super market in Bogor	4,850	82	95
20	Mullet	Super market in Jakarta	4,850	70	91
21	Mullet	Super market in Jakarta	5,000	45	83
22	Mullet	Super market in Jakarta	5,000	63	90
23	tuna fillet	Super market in Jakarta	14,100	36	32
24	Red snapper	Super market in Jakarta	16,400	55	70

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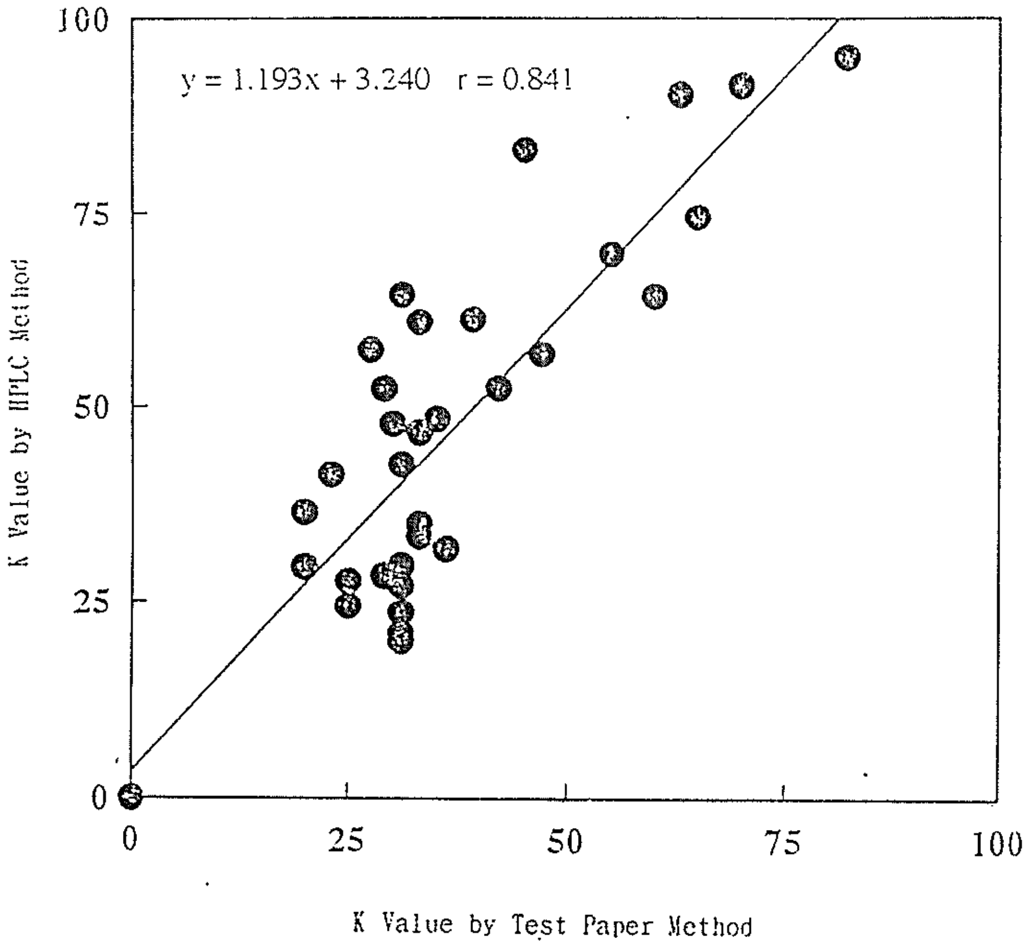

Fig. 1. Correlation of K values determined by test paper method and HPLC method.

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