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(Research Report For Fishery Technology)

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STUDY ON MERCURY CONTENT OF "MARKET" COCKLES FROM RETAILERS AT MUARA KARANG, JAKARTA

By

Hari Eko Irianto, Prih Sarnianto
Y. Nuri Fawzya and Sumpeno Putro

ABSTRACT

Evaluation on mercury (Hg) content of "market" cockles from retailers at Muara Karang have been carried out.

The results showed that the mercury content of all samples were still below the FDA/Indonesian maximum allowable limit of 0.5 ppm, and green mussels have the highest level of mercury (0.451 ppm). Furthermore, the green mussels had the highest value of pH, TVB and moisture, i.e. 6.29, 13.86 – 15.90 mgN%, and 81.49% respectively.

Microbiological analysis showed that the highest total bacterial count i.e. (14.7 – 40.0) 10⁴ was found on green mussels, while the highest *Staphylococcus* i.e. (23 – 24) 10³ was found on blood cockles, and mold was found on blood cockles i.e. 300 – 700. However, *Escherichia coli* test was negative.

All samples had high score of sensory evaluation.

INTRODUCTION

Cockles is one of the fishery commodities with good nutritive values. Based on the research of Directorate of Nutrition, Department of Health (1979) moisture, protein, fat and carbohydrate content of cockles are 85%, 8%, 1.1% and 7.6% respectively, and they can support energy as much as 59 calories/100 grams. Cockles has a good prospect to increase the protein consumption of Indonesian people and open the new field of work through the cockles culture.

Cockles often found in Indonesia are green mussels (*Mytilus viridis*), blood cockles (*Anadara granosa*) "kerang kepah" (*Meritric spp.*), "kerang geleng" (*Chione isabelina*) and "simpang laut" (*Placenta placenta*). Blood cockles has a wide production area, such as shown at table 1., and Malaka strait being the highest production area, i.e. 34,362 tons.

The cockles are harvested from the sea which area often polluted by pathogenic organisms, heavy metal, etc. Environmental condition greatly effect the quality of cockles. Mercury is one of main pollutants which can cause a disease called "Minamata". According to Connell (1975), mercury is a cumulative poison, and could cause injury to health through progressive and irreversible accumulation in the body as a result of ingestion of repeated small amounts. In fact, most of mercury in fish (and in most tissues) is in form of methyl mercury complex which is more toxic than mercury itself.

Table 1. Indonesia production of blood cockles in 1981.

Coastal area	Volume (tons)
Western Sumatera	4
Southern Jawa	5
Malaka Strait	34,362
Eastern Sumatera	408
Northern Jawa	1,925
Bali, Nusatenggara, Timor	30
Southern/Western Kalimantan	165
Eastern Kalimantan	191
Southern Sulawesi	2
Maluku and Irian	318

Source : Directorate General of Fisheries, 1983.

This research evaluated the mercury content of "market" cockles, especially from retailers at Muara Karang Jakarta. Information from retailers revealed that cockles was caught by fishermen at Jakarta Bay, samples were collected in March, 1985.

MATERIALS AND METHODS

Materials

The cockles used in this research are green mussels (*Mytilis viridis*), blood cockles (*Anadara granosa*), "kerang bulu" (*Anadara inflata*), and "kerang tahu", were obtained from retailers at Muara Karang, Jakarta.

Methods.

Samples were brought alive to RIPT's laboratory in plastic baskets.

Analysis Parameters

- a. Chemical Analysis : moisture, pH, TVB, ash and mercury content.
- b. Microbiological analysis : Total Plate Count, mould, *Staphylococcus*, coliform and *E. coli*.
- c. Sensory evaluation : sensory evaluation was carried out using a nine-scale hedonic test.

RESULTS AND DISCUSSION

A. CHEMICAL ANALYSIS

Mercury Content

The results showed that green mussels has the highest mercury content, i.e. 0.451 ppm, while blood cockles, "kerang bulu" and "kerang tahu" were 0.197 ppm, 0.208 ppm and 0.370 ppm respectively.

For sufficient margin of safety and a fairly high level of weekly fish consumption (4 to 8 meals of 150 grams each) the concentration of mercury in edible portion should not exceed 0.5 to 1.0 ppm wet weight (Connell, 1975). FDA has established a maximum tolerance concentration of mercury of 0.5 ppm in fish and shellfish (Graham, 1980), Referring to "Food and Drug Regulation" of New Zealand (1973), Indonesian Department of Health made a standard of mercury content, i.e. 0.5 ppm (Anonymous, 1981).

It appears that all samples have lower mercury content compared to FDA and Indonesian standard, which indicated that green mussels, blood cockles, "kerang bulu", and "kerang tahu" from retailers in Muara Karang were safe for a daily intake and market commodities. The green mussels' mercury content can be classified as a fairly high, because it is close to the maximum tolerance concentration of mercury. Another study, however, indicated higher level of mercury i.e. 0.7 ppm (Anonim, 1980), which might be due to different location and time of sampling.

Among our samples there was a difference in mercury content, which could imply that there were differences of capability of cockles to absorb mercury or possibly the samples are collected from different location.

Other Chemical Analysis

Other chemical analysis (pH moisture, Total Volatile Base and ash content) are considered as supporting analysis because all samples were still alive and in fresh condition. Green mussels had the highest value of pH, moisture and TVB, i.e. 6.29, 8.49% and 13.86 -15.90 mgN% compared to other samples.

Table 2. Chemical Analysis of Cockles from Retailers at Muara Karang, Jakarta.

Sample	Moisture (%)	pH	TVB (mgN%)	Mercury (ppm)	Ash (%)
Green mussels	81.49	6.29	13.86 – 15.90	0.451	2.49
Blood cockles	80.20	6.14	7.34 – 11.82	0.197	2.25
"Kerang bulu"	80.92	6.17	6.72 – 7.34	0.208	2.37
"Kerang tahu"	81.09	6.17	9.38 – 11.01	0.370	2.72

B. MICROBIOLOGICAL ANALYSIS

Microbiological profile of cockles will reflect the environmental conditions where the animal live. Poor quality environment usually produce poor quality of cockles, and indicated by high count of undesirable organisms especially pathogenic bacteria.

Table 3. Microbiological Analysis of Cockles from Retailers at Muara Karang, Jakarta.

Sample	TPC* (x 10 ⁴)	Staph** (x 10 ⁴)	Coliform (MPN)	E. coli	Mold
Green mussels	14.7 – 40.0	8.0 – 13.1	> 2400	neg. ***	100 – 180
Blood cockles	11.0 – 13.0	23.0 – 27.0	240 – 480	neg. ***	300 – 700
"Kerang bulu"	5.4 – 16.0	5.5 – 24.0	> 2400	neg. ***	160 – 170
"Kerang tahu"	5.9 – 25.0	17.4	> 2400	neg. ***	150 – 180

Note : * TPC = Total Plate Count
 ** Staph = *Staphylococcus*
 *** neg. = negative.

Table 3 showed that green mussels had the highest bacteria count (Total Plate Count) among the other cockles, but it contained the lowest count of *Staphylococcus*. ICMSF (International Commission on Microbiological Specification for Foods) has recommended a limit of bacteria count of 10⁶/gram for freshfish and fishery products (Sumner, 1981). Standard of *Staphylococcus* usually in the range of 10² – 10³/gram, but food usually incriminated in food poisoning has a count in excess of 10⁶/gram (Sumner, 1981). Compared to the Standard mentioned above, all of the samples was safe for food consumption, because the total bacterial count and *Staphylococcus* count were still below the recommended maximum tolerance.

All of the samples free from *Escherichia coli*, although green mussels, "kerang bulu" and "kerang tahu" have a high content of coliform (> 2400 MPN). According to Frazier and Westhoff (1978) the coliform bacteria are, in general, undesirable in foods, for their presence in some foods is considered to be indicative of sewage contamination and hence of the possible presence of enteric pathogens, and growth in foods results in their spoilage. Explanation above gave in indication that the habitat of cockles have been contaminated by sewage or other contamination agents.

Mold was found on all of the samples, but might arise as a result of recontamination by spores from the air, container, washing water etc.

C. SENSORY EVALUATION

Table 4. Sensory Evaluation of Cockles from Retailers at Muara Karang, Jakarta.

Sample	Acceptance (Hedonic test of 9 scales)
Green mussels	8.31
Blood cockles	8.82
"Kerang bulu"	8.62
"Kerang tahu"	8.40

The results of sensory evaluation showed that all of the samples still have a high score of acceptance to panelists. This phenomena was confirmed by the chemical and microbiological analysis, and indicated that cockles used in this study were in fresh condition.

CONCLUSION.

With regard to the mercury content, all of the cockles from retailers at Muara Karang, Jakarta, have mercury content lower than 0.5 ppm (FDA/Indonesia Departemen of Health maximum tolerance concentration. In addition, Total Bacteria Count of all samples were still below ICMSF Standard. All samples are found to be acceptable to the panelists.

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