

CHROMIUM CONTENT OF MILK-FISH (*Chanos chanos*, Forskal) IN BRACKISH WATER POND AROUND BABON RIVER OF SEMARANG COASTAL AREAS, CENTRAL JAVA, INDONESIA

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ABSTRACT

The aims of study were to determined Cr content in water and in Milk-fish around Babon River Estuary Semarang. Water drinking Criteria issued by Indonesian Ministry of Environmental and Concentration Factors Index were used for analyse the Chromium content. The results indicated that Chromium content in water and in Milk-fish were over of the recommended maximum level. The value of concentration factor index of the Cr content had been found low up to accumulation

Key ward: Chromium contents, brackish water pond, milk-fish

I. INTRODUCTION

Babon river is located at the coastal area of East Semarang district. Around Babon river, many factories or industries located in this area because the Genuk district (East Semarang) were used for Industrial Zone.

The source of water pollution in Babon River is mainly the waste water cause from the activities of industries. The effluent of waste water from industrial activities, directly or indirectly discharge to this river. They are three tanning leather industries (Puspita, Abadi and Condro) and one textile industry located around Babon river.

Both of them during the production processes to polluting (contaminating) the Babon river, and will cause an increasing the chromium content.

Chromium is dangerous and toxic chemical compound, where in high content in the waters could disturb the water ecosystem. Heavy metals, like Chromium, could create accumulation of organic matter or anorganic matter in the body of organism (Nriagu, 1983 and Van Esch, 1977).

There are many tambak bandeng (brackish water pond of Milk-fish) in coastal areas around Babon river. The high of content Chromium in Babon waters due to bio-accumulation and

bio-magnification process of Chromium in the tambak ecosystem via "Aquatic food chain". Aquatic organisms may be taking the toxic compound from surrounding waters in many ways, these include : (1) direct uptake through their body surfaces; (2) uptake through respiration or ingestion of water; or (3) uptake through consumption of food containing chemical pollutants (Jardine, 1993).

It is therefore, could be presumed that Chromium (Cr) accumulation to occur in bandeng's body. If value of chromium content in Milk-fish body is higher than the maximum level allowed, it may be dangerous to be consumed by peoples. The previous study reported that the accumulation of Chromium exhibited mutagenicity and proliferation in organism (Nriagu, 1983). Heavy metal ions can bind strongly to various biological activity in living tissue. They are in active metal enzyme complexes and disrupt many metabolic processes, as well as alter the ratios of blood components, change membrane permeability, inhibiting oxidative phosphorylation and the synthesis of protein, nucleic acid, and other (Konovalov, 1994). The Chromium forms chemical matters as heavy metal pollutants and dangerous to water quality and organism, not only to micro organism but also to nekton like Milk-fish. Very few investigations were done about Cr. content of Fish. Many peoples in Indonesia, especially in Northern Coastal of Java were produce & consume the Milk-fish . Therefore it is important to study the Cr. content of Milk-fish in brackish water pond around Babon River of Semarang Coastal areas.

The objectives of this study is to determined :

- (1) The concentration of Chromium content in waters of Babon river
- (2) The concentration of Chromium content in waters of tambak bandeng (Brackish water pond of Milk-fish).
- (3) The concentration of heavy metal chromium in Milk-fish tissues which has been caught in coastal area near Babon river .

II. MATERIAL AND METHODS

- (1) Water samples were taken from Babon river (estuary) of and brackish water pond of Milk-fish culture.
- (2) Milk-fish samples (*Chanos chanos* Forskal) will be caught from tambak of Milk-fish in coastal areas around Babon estuary

Filed Work :

This research have done from January 1998 to April 1998 for surveys in wet season. Chromium content analysis be reformed in laboratory between May and June 1988. For dry season, field survey starts at July until September 1988 and Chromium content analysis in laboratory between October and November 1998. Three phase of this research, the first is preliminary study, the second is samples taking and the third is data analysis. Based on preliminary study, 6 (six) stations was taken systematical as is showed at fig. 1.

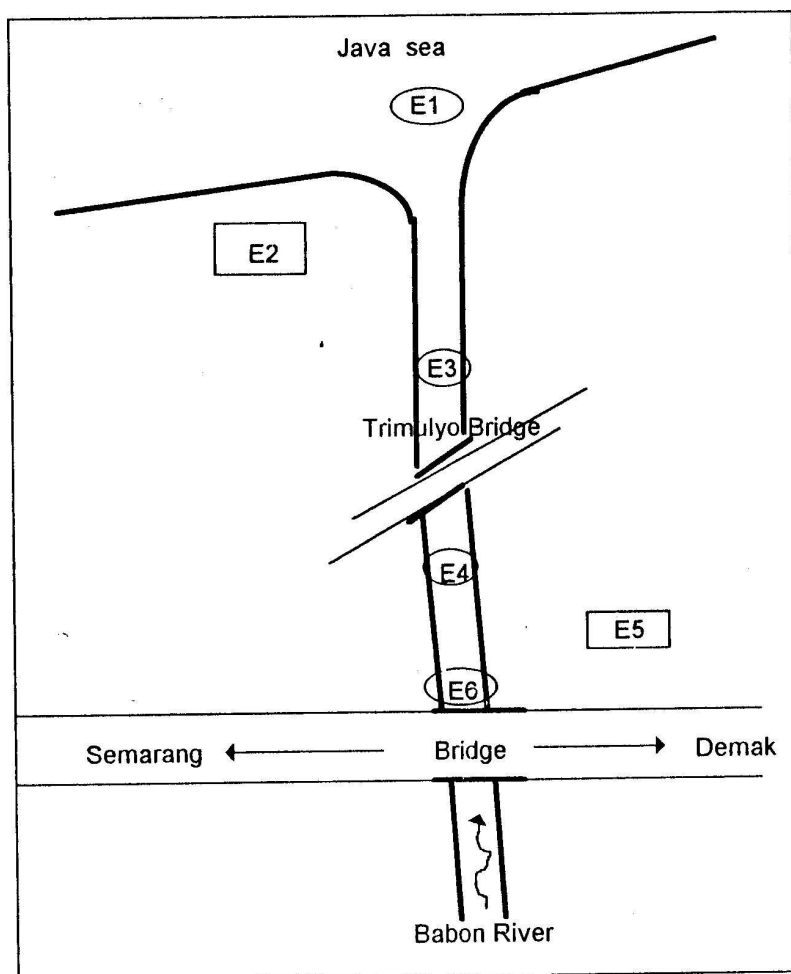


Fig. 1
Sampling location

- E1 represent estuary or location of industrial waste accumulation, included chromium.
- E2 represent tambak areas located near the estuary
- E3 represent to river waters located not so far from the estuary (about 1 Km)
- E4 is waters of Babon river between Kampung Trimulyo Brige and Mean Street Demak Brigde
- E5 represent to tambak areas located far from the estuary
- E6 represent waters of the Babon river located far from the estuary

The examination of water quality and chromium contents was use bottle sampler of 5 liters volume. Each sampling was triple replication. Physical and chemical analysis in situ and in laboratory. The water quality analysis is based on the Indonesian National Standard : test of water source and waste water quality, published by Bapedal (Department of Environment Impact Control).

Bandeng samples are taken from 2 station in tambak Bandeng (E2 and E5). Two Bandeng (size consump-

tion) were taken in each station with triple replication.

To analyses Chromium content in waters body of Babon river and waters of tambak Bandeng were being used procedure of heavy metal Chromium analysis in the water. Analysis under AAS in Laboratory of Gadjah Mada University. Index of Concentration Factors (ICF) was used to analysis of organism capability to accumulate the heavy metal (Van Esch, 1977). The result could be seen, in Table 1 and Table 2 as follow;

Table 1. Chromium content in 6 station February 1998 (Rainy season)

No	Station	Chromium content (mg/l)		
		1 st Replication	2 nd Replication	3 rd Replication
1	E1	0,010	0,005	0,005
2	E2	0,008	0,003	0,003
3	E3	nd	nd	nd
4	E4	nd	0,005	0,003
5	E5	0,005	0,005	nd
6	E6	nd	0,005	0,008

Table 2. Chromium content in 6 station August 1998 (Dry season)

No	Station	Chromium content (mg/l)		
		1 st Replication	2 nd Replication	3 rd Replication
1	E1	nd	0.030	0.030
2	E2	0.080	0,080	0,020
3	E3	0.070	0,020	0.010
4	E4	0.020	nd	nd
5	E5	0,050	0.020	nd
6	E6	nd	0.030	0.030

Where : Nd represent not detected.

Based on Table 1 and Table 2, could be explained in the rainy season, chromium content in milk-fish tissue from tambak areas located near the estuary (E2) as follow: first replication = 1.640 ppm, second replication = 1.029 ppm and third replication = 1.112 ppm. In the dry season, chromium content in the milk fish tissue from this tambak 0,440 ppm for first replication, not detected in second replication and 0.150 ppm in third replication. While in Milk-fish from station E5 or tambak areas located far from the estuary as follow : first replication = 2.530 ppm, second replication = 2.2180 and third replication = 1.700 ppm.

The source of chromium is varied, mainly from industrial process e.g. electroplating, tannery, leather, textile and paint industries and domestic waste. In the waters column, chromium can exist in two ways : the first natural and the second non natural. Chromium exist natural because several factors of physical like erosion and non natural most caused by impact of man made activities. Source of chromium caused by man made activities as industrial waste and domestic waste.

In waters of Babon river, source of chromium content is the waste water from activity of tannery leather and textile fabrication located around Babon river. The factories located Babon river : (1) PT Buana Sakti Tannery, (2) PT Jaguar Tannery, (3) PT Condro Cipto Tannery, (4) PT Puspita Sari (5) PT Cold Storage (Mina Baruna) and (6) PT Fodder Company (PT Proteina Prima).

Chromium content in the rainy season has been found as follow : at the waters estuary (E1) between 0.050 – 0.010 ppm. In the tambak water near the estuary (E2) between 0.003 – 0.008

ppm. In the waters of Babon river near Kampung Trimulyo Bridge (E3) not detected and (E4) between not detected – 0.050 ppm. And in the Tambak far from the estuary (E5) between non detected – 0.005 ppm. In the waters of Babon river far from the estuary (E6) between not detected – 0.008 ppm (Table 1). Base on water quality criteria by Ministers of Environment, that maximum level of Cr content is 0.050 ppm. So, in rainy season the chromium content in the tambak waters and in the waters body of Babon river still under level.

Where during the dry season the chromium contents, in the waters around Babon river were found as follows : at the waters Estuary (E1) between not detected – 0.030 ppm. At the tambak areas located near the estuary (E2) between 0.020 – 0.080. At station E3 between 0.010 – 0.070 ppm, station E4 between not detected – 0.020 ppm, E5 between not detected – 0.050 ppm and in Station E6 not detected – 0.030 ppm (Table 2). From the Table 2 indicate that value of chromium content in tambak water located near the estuary (E2) at first and second replication is 0.080 ppm. Also in waters of Babon river located near the Kampung Trimulyo Bridge (E3), value of Chromium content at first replication is 0.070 ppm. That mean in this station the value of chromium content have more than the maximum level limit.

Compared by rainy season , in the dry season at station E2 and E3, the value of chromium content has more than the maximum level limit. The value of chromium content in rainy season less than in the dry season because in the rainy season have many dilution in the water body.

Further more, chromium content in Bandeng tissue from station E2 in the rainy season is 1.640 ppm; 1.029 ppm and 1.112 ppm for first, second and third replication. Based on General Directorate of drug and food control no: 03725/B/S/SK/VII about maximum level limit of heavy metal in food, especially for chromium is not exist. For this case is being used chromium content criteria for water drinking. Drinking water criteria of Chromium content recommended by WHO is 50 ug/Lt (Forstner and Prosi, 1978). Inland waters criteria of Chromium by Indonesian Ministry of Environmental (KEP.02/Menteri/1/1988) is 50 - 100 ug/ Lt. That mean chromium content in Bandeng tissue is more than maximum level permitted. Chromium content in Bandeng tissue from station E2 in the dray season show it was exceed the maximum level limit, except in second replication is not detected. Also the value of chromium content in Milk-fish tissue take from tambak far from the estuary (E5) is to exceed maximum level limit (1.700 ppm – 2.530 ppm).

In the poin view of Index of concentration factor (ICF) in station E2 was being found 205,343 and 371 for first, second and third replication in rainy season. The value of ICF in dry season is 5.5 and 7.5 for first and third replication. At station E5 or tambak water located far from the estuary is 50.6 and 109 for first and second replication. According to Hutagalung (1990), the ICF value is depend to kind of heavy metal, individual organism, duration in the water column and water environment condition. Three category of ICF value (Van Esch,1977): (1) ICF value more than 1000 namely character of high accumulative, (2) ICF value between 100 – 1000 namely middle

accumulative character and (3) IFC value is less than 100 namely low accumulative character. So that, chromium accumulative character of Milk-fish in the research areas is low – middle accumulative character. This value is being supported by the result research Sri Murtiati (1998) was studied at Sayung Tambak areas (near east of Babon river) in 1996 has found the ICF value is low – middle accumulative character.

In conclusion, around Babon river estuary was found Chromium content in waters of Babon river, tambak waters and in Bandeng tissue, because in this areas dominated by tannery / leather industries that mainly use chromium in their industries process. If compared by water quality criteria, in several location were found more than the recommended of maximum level.

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