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The Content of Polycyclic Aromatic Hydrocarbons (PAH) in The Green Mussels (*Perna Viridis L*) Around The Coast of Makassar

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Abstract. This research aims to obtain the moisture and fat content in the determination of the concentration of PAH in the Green Mussels (*Pernaviridis L*) around the coast of Makassar and viewing the content of PAH in the green mussels at each station. Based on the analysis of moisture and fat content, the higher the content the smaller the PAH concentration will be obtained. PAH concentrations in the green mussels in 17 station sampling are only found on 3 stations. These stations are analyzed and acquired the highest moisture content at station 8 (IKI 1) which allows to obtain the PAH concentration in small quantities. It is supported with fat content that slightly greater than the green mussels on station 14 (UTA 1), while the higher fat content that is at station 17 (LAE 1) indicates the ability of a green mussel to deter the PAH accumulated in the body of green mussels so that its content has decreased. The total of PAH concentration from each sation, the sampling of the green mussels retrieved most at station 9 (IKI 4-5 cm) with the large size i.e. 336.56 ppm, it caused by the area that is not too far from Sukarno-Hatta port area as well as the Makassar industrial area (KIMA) as well as the activities of motorcycle traffic that is very crowd. Based on the rule of MKLH that the PAH content in thw samples of the green mussels are already not consumable so that we need to be careful especially for the communities around the coast of Makassar. Furthermore, this research is beneficial for researchers who are willing to conduct further research about the causes of the high content of PAH in Green Mussels around the coast of Makassar. Also, researchers will be able to expand such research in other locations.

1. Introduction

Indonesia consists of 17,508 Islands with a long coastline of over 81,000 km and 70% of the population live in Coastal areas [1],[2]. Edge States of the Malacca Strait has managed to agree on provisions in addressing environmental issues, but the efforts of law enforcement against the handling of environmental issues in the Malacca Strait have not yet to be well implemented because the coordination between agencies in law enforcement have not been integrated [11].

Some studies suggest that the content of PAH in total around 2,000 ppm (mg/kg) already cause the pollution [4,5,7,14] stated that the content of petroleum in the waters as much as 400 ppm are already polluting the environment. According to the decision of the Minister of the Environment, the value of the raw quality of PAH as one of raw quality of sea water for the biota is 3 ppb or 0.003 μ g/L or 0.003 ppm.



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The existence of PAH needs to be always monitored because it can cause mutation of genetic material and causes tumors and cancer diseases. Carcinogenic properties and toxicity of PAH compounds depends on the molecular weight and its log K_{ow} [3,6].

According to another study, the distribution and source of PAH in the green mussels (*perna viridis l*) around the coast of Makassar has been known to be unknown but the cause of high levels of PAH in the body of green mussels around the site [12]. It can be affected by water content and fat content in the body of the green mussels.

2. Method

2.1. Research Tools

The tools used in the study were obtained from Pyrex, i.e. the glass, Soxhlet, Liebig, heating mantle, beaker, graduated cylinder, volumetric flask, stirrer, the desiccator, dropper pipette and wash bottle, spatula, magnetic stirrer (CMSI), mortar and pestle. Tools for evaporation is rotary evaporator Buchii R II, vacuum pump (Hitachi, Ltd.), sieve 1.00 mm No. 18 (Fisher Scientific Company), 204 analytical balance (Mettler Toledo), Oven model 501 (Fisher). Tools used in the field is the thermometer (100°C) of Hanna HI 8314, hand refractometer, Van Veen Grab, GPS (Global Positioning System) type Garmin 76 CSX, the gas tube from the variety of gas, turbidimeter, and bottle, mikropipet (Gilson), blender (Waring), injectors (Hamilton Co.), Vortex (Maxi Mix II), Eppendorf, bottle tip, and a yellow tip, are tools that are used at the time of analyzing the sample of extracts by gas chromatography detector FID from the Shimadzu QP 2010.

2.2. Procedure of Research

Green mussel samples were taken around the coast of Makassar on 17 stations, using a sampling technique using three stages [12,13]. Determination of moisture content is done by weighing the sample of the green mussels as much as 10 grams and heated in a cup of dry porcelain which its weight has been known, then put in the oven to a temperature of 104 °C and cooled into a desiccator for about 30 minutes. The magnitude of the lost moisture can be known after weighing. Determination of fat content in the green mussels by analyzing the fat content in the green mussel *Perna viridis L* comes from IMFJ [10,12,13].

The seven compounds of standard spiking (naphthalene, phenanthrene, acenaphthene, fluoranthene, pyrene, benzo(a)anthracene, and perylene) are of the green mussels that are already blended smoothly, then Soxhlet extracted with 150 ml of a mixture of hexane and dichloromethane (1:1) at a temperature of 70 °C for 18 hours [1, 2, 13].

Adsorbents used in chromatography is 70-240 mesh of gel silica and alumina (1:1 = v/v) and anhydrous Na_2SO_4 as high as 1 cm as well as filter paper (that has the same diameter with the columns) is inserted into the fractionation column in a row. The column is filled with n-hexane and it eluted repeatedly. Then, fractionating the EBO into the aliphatic fraction and aromatic contains PAH using gel silica and alumina (1:1 = v/v) with n-hexane to get the aliphatic fraction. To get an aromatic fraction/PAH, that column is eluted using 20 ml DCM: n-hexane (1:1). Separation of aliphatic fractions and PAH were aided by a UV lamp, the fraction of PAH will be seen luminous. The aromatic fraction was then reconstituted with 1 mL of DCM solvents and analyzed using GC-FID.

3. Result And Discussion

3.1. Determination of The Moisture Content and The Fat content of The Sample of Mussels

Analysis of moisture content of the green mussels gives the results as much as 12.64 – 37.91% (Table 1), while the fat content of the green mussels only gives the results revolves around the 3.61 – 10.51% (Table 2).

Table 1. Determination of The Moisture Content of Each Sampling Station of The Green Mussels (the average value of 3-time measurement)

Number	Station	Wet Weight (g)	Dry Weight (g)	Fat Content (%)	Average (%)
8	7,65	LAE 1.1	2,84	6,16	0,22
	5,64	LAE 1.2	2,43		0,14
	5,20	LAE 1.3	2,63		0,14
14	5,35	UTA 1.1	6,89	4,77	0,37
	5,35	UTA 1.2	6,89		0,37
	3,61	UTA 1.3	6,89		0,27
17	10,51	IKI 1.1	2,31	9,11	0,24
	6,75	IKI 1.2	3,03		0,20
	10,06	IKI 1.3	2,03		0,20

The higher the moisture content and the fat content of a sample of the green mussels is the smaller the concentrations of PAH in the body of the green mussels will be. Based on the data on (Table 1 and Table 2) above shows that the concentration of PAH in the body of the green mussels at three stations, the highest sampling of moisture content is at station 8 (IKI1), that is 31.02% which allows the concentration of PAH were obtained in the small quantities.

It is supported with the fat content that slightly larger (6.16%) than the green mussels on station 14 (UTA1) that is 4.77%. The higher fat content in station 17 (LAE1) indicates the ability of the green mussels to determine the PAH accumulated in the body of the green mussels so that the concentration of PAH at 17 stations (LAE1) will decrease.

Table 2. Determination of The Fat Content of Each Sampling Station of The Green Mussels (The Average Value of 3-times measurement)

Number	Station	Wet Weight (g)	Dry Weight (g)	Mosture Content (%)	Average (%)
8	37,91	IKI 1.1	31,02	2,31	0,87
	18,01	IKI 1.2		3,03	0,55
	5,20	IKI 1.3		1,93	0,72
14	14,54	UTA 1.1	21,53	5,66	0,82
	18,08	UTA 1.2		5,64	1,02
	31,96	UTA 1.3		6,89	2,20
17	23,13	LAE 1.1	23,61	2,84	0,66
	35,05	LAE 1.2		2,43	0,85
	12,64	LAE 1.3		1,80	0,23

3.2. PAH concentrations in the green mussels around the coast of Makassar Green Mussels (*Perna viridis* L)

Based on (Figure1) indicated that the total of PAH concentration of each station obtained most at station 9 (IKI 4-5 cm) with the large size i.e. (336,56 ± 36,82) ppm.

Station 9 (IKI 4-5 cm) is located at a shopping complex and the traffic of motorcycle that are very crowd and close to human activities in the main land, mainly from the industrial area of Makassar (KIMA) and landfill Antang which emptying to Tallo River. PAH concentrations in the samples of the green mussels, especially at the station IKI1-and the body size of mussels (4-5 cm) and station UT1 on all the body size of the green mussels (2.5-3 cm), (4-5 cm) and (5-6 cm) have the greater PAH concentrations compared to the station Lae-lae because both of these stations are located in areas where are not too far from Sukamo-Hatta port area and the Makassar Industrial Area (KIMA) as well as the activities of the traffic of motorcycle that is very crowd.

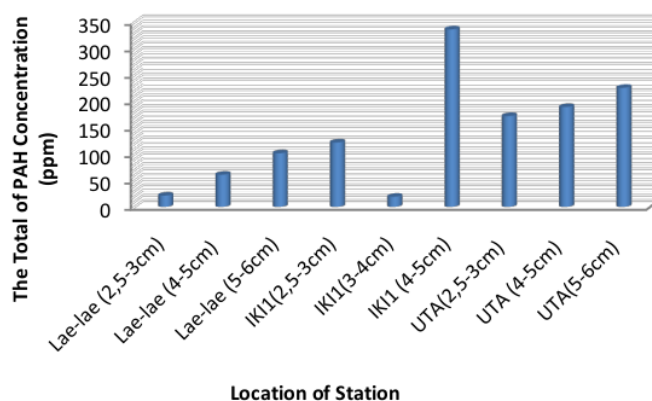


Figure 1. The total of PAH Concentration The Samples of The *Green Mussels*

4. Conclusion

The conclusion can be drawn as follows:

- The outcome of analysis of the moisture and the fat content is the higher the content of the sample of the green mussels the smaller the PAH concentration will be obtained. The highest moisture content at station 8 (IKI 1) which allows the concentration of PAH were obtained in small quantities, while the higher fat content is at station 17 (LAE 1) indicates the ability of the green mussels to determinant PAH accumulated in the body of the green mussels so that its content has decreased.
- The total of PAH concentrations from each sampling station of green mussels retrieved most at station 9 (IKI 4-5 cm) with the large size i.e. 336.56 ppm, because the area is not too far off from Sukarno-Hatta port area as well as the Makassar Industrial Area (KIMA) as well as the activities of the traffic of motorcycle that is very crowd.
- Based on the rule of MKLH that the PAH levels in samples of the green mussels are already not consumable so that we need to be careful especially for the communities around the coast of Makassar.

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