DETERMINATION OF HEAVY METAL (PB, CD AND ZN) IN BLUE-GREEN ALGAE (*NOSTOC COMMUNE*) BY ATOMIC ABSORPTION SPECTROPHOTOMETRY

[1]PIMCHANA HOKTHA, [2]APISIT KAEWMEKHA

[1,2]Department of Chemistry, Faculty of Science,Thaksin University, Thailand
E-mail: [1]hoktha@gmail.com

Abstract- The blue-green algae(*Nostoc commune*) is edible algae. It was traditionally used tomaintain the stomach and intestines.Blue-green algae occur naturally in a wide varietyof environmentsincluding ponds, drainpipe area and flooding area.All of water sources have been contaminated.Therefore the determinations of heavy metals in algae wereimportant.The samples were collected from five areas. The samples were analyzed byAtomic Absorption Spectrophotometer (AAS). The results showedthe ranged concentration of 2.3-3.7, 15.0-29.0 and 7.9-76.3 mg/kg dry weight for Cd, Pb and Zn, respectively. The concentration of Cd and Pb were significantly higher than permission limits set by Food Safety Law and Regulation (Thailand). 1981. The blue-green algae consumption should realize this and focus on the sources of growth.

Keywords- AAS, Blue-green algae, Cadmium, Lead, Zinc

I. INTRODUCTION

The property of Blue - Green Algae (BGA) is an anti-inflammatory natural product can prevent the inflammatory diseases. [1] It's popular for cooking as a salad in many countries (Philippines Indonesia, Japan, Taiwan, and Thailand). In addition to value added, BGA was produced to supplementation which significantly reduced total plasma cholesterol and triglyceride.[2]



Fig.1. Blue-green algae (*Nostoc commune)*

Scientific classification

Domain:	Bacteria
Kingdom:	Eubacteria
Phylum:	Cyanobacteria
Order:	Nostocales
Family:	Nostocaceae
Genus:	*Nostoc*

The quality of BGA is depending on the sources algae growth. The consumer should be avoided BGA from the contaminated area that are harmful to health. The objective of this work is to determine the concentration of heavy metal (Pb, Cd and Zn) in Blue-Green Algae (*Nostoc commune*) by Atomic Absorption Spectrophotometry.

II. DETAILS EXPERIMENTAL

2.1. Sampling and Sample Preparation

The blue-green algae samples were collected from natural stream, ponds, drainpipe area and flooding area. The samples were dried at room temperature before dried in the oven at 110 ^{o}C for 4 hours. Samples were ground in the mortar. Three grams of ground sample in a porcelain crucible was heating on a hot plate until the sample has charred completely. Take the crucible out of the hot plate and allow cooling. The ash was dissolved in 10 mL HCl, filtered and then transferred to a 50 mL volumetric flask and make to volume with deionized water.

2.2. Preparation of calibration curve

The standard solution of Cd, Pb and Zn for AAS (1000 mg/L) were diluted to prepare a set of standard concentration 1.0 to 5.0 mg/L. The concentrations of heavy metals were determined in an air–acetylene flame by AAS as showed in Table1.

Table 1.Optimal Condition of Flame Atomic Absorption Spectrometer(AAS)

Optimal Condition	Heavy Metal		
	Pb	Cd	Zn
Mode	Absorbance	Absorbance	Absorbance
Wavelength : nm	283.3	228.7	213.9
Slit width : nm	0.7	0.7	0.7
CL (Current : mA)	7.0	7.0	7.0
Fuel(L/min)	Air:Acetylene (13.50 : 2.00)	Air:Acetylene (13.50 : 2.00)	Air:Acetylene (13.50 : 2.00)
Flame Characteristic	Lean-blue	Lean-blue	Lean-blue

III. RESULTS AND DISCUSSION

3.1 Calibrationcurve

The organic matter and other matrix in BGA were destroyed by heat and acid digestion. The sample concentrationswere obtained from the calibration curve. The absorbance of the sample corresponds to a concentration that can calculate from the linear equation as showed in Table 2.

Table 2.Calibration curve of the determination Cd, Pb and Zn (1.0-5.0 mg/L)

Heavy Metal	Linear Equation	R^2
Cd	y = 0.065x	0.985
Pb	y = 0.006x	0.997
Zn	y = 0.118x	0.971

3.2. Percent recovery and precision

The recovery of Cd, Pb and Zn in BGA were obtainedby adding the standard solution of each metal (2.0 mg/L).

Table 3. Percent recovery and precision of Cd, Pb and Zn determination in Blue-green algae (*Nostoc commune*)

Heavy Metal	% Recovery, (mg/L)	%RSD
Cd	92.3	6.8
Pb	94.0	7.5
Zn	93.2	2.3

3.3Concentration of Cd, Pband Zn in BGA samples

The blue-green algae (Nostoc commune) from five areas (Natural Stream1&2, ponds, drainpipe and flooding area) were determined.

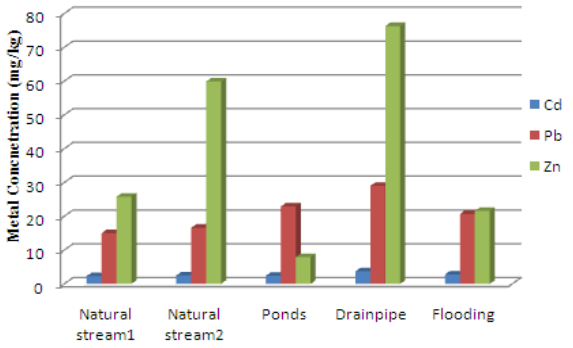


Fig.2. Heavy metals concentration in Blue-green algae (*Nostoc commune*) that collected from different area

Table 4. Permissible limits of Someheavy metals given by Food Safety Law and Regulation (Thailand). 1981.

Heavy Metals	mg/kg		
	Cd	Pb	Zn
Food	2.0	1.0	100.0

CONCLUSIONS

The blue-green algae (*Nostoc commune*) were collected from five areas (Natural Stream1&2, ponds, drainpipe and flooding area) at Songkhla province. The organic matter and other matrix in BGA were destroyed by heat and acid digestion. The sample preparation was successful by given high percent recovery more than 90%. And % RSD that is shown the good precision were less than 7%

From the results showed that concentrations of heavy metals were ranged 2.3-3.7, 15.0-29.0 and 7.9-76.3 mg/kg dry weight for Cd, Pb and Zn, respectively. The concentration of Cd and Pb were significantly higher than permission limits set by Food Safety Law and Regulation.[33] However, the amount of BGA per one serves less than one kilogram. The harmful is may accumulate in the body that may effect in the future.

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