HEAVY METALS (COPPER, ZINC AND LEAD) IN MANGROVE SEDIMENT AT SELANGOR RIVER, KAMPUNG KUANTAN

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HEAVY METALS (COPPER, ZINC AND LEAD) IN MANGROVE SEDIMENT AT SELANGOR RIVER, KAMPUNG KUANTAN

By

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A Project Report Submitted in Partial Fulfilment of the Requirements for the Degree of Bachelor of Forestry Science in the

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DEDICATION

For my beloved family:

Zainal Bin Abdullah

Salmah Binti Hassan

Also my siblings.

To my supervisor Assoc. Prof. Dr Seca Gandaseca,

To all my friends,

Thank you for your encouragements supports

And the sacrifices that you have given.

Thank you for everything. May Allah Bless All of us.

ABSTRACT

Mangroves are woody plants that grow at the interface between land and sea in tropical and subtropical latitudes where they exist in conditions of high salinity, extreme tides, strong winds, high temperature, and muddy anaerobic soils. The objectives of this study were to determine the selected heavy metals (Cu, Zn, and Pb) contamination in mangrove sediment at Selangor River, Kampung Kuantan, Kuala Selangor and compare heavy metals (Cu, Zn, and Pb) content in mangrove sediment between different plots and different depths. Physical properties (soil moisture and soil texture) and chemical properties (pH water, soil electrical conductivity, heavy metal (Cu, Zn, and Pb) of soil were defined by plots and depths. Data obtained were analyzed using the Statistical Analysis System (SAS) version 9.4 software. The results showed that the sediment was in class sandy clay and soil moisture in all plots and at all depths were higher. Mangrove area in Selangor River contained wet sediment. Contamination of soil by heavy metals affected by many factors, including soil pH and soil electrical conductivity. Element Lead (Pb) was analyzed using Inductively Coupled Plasma (ICP). Element Copper (Cu) and Zinc (Zn) were analysed using Atomic Absorption Spectrometer (AAS). The contamination of sediment with Zn was higher in all plots and at all depths than Cu and Pb. The heavy metal of Copper (Cu), Zinc (Zn) and Lead (Pb) were found in all plots and at all depths. The sediment in all plots and at all depths were contaminated with these heavy metals because of the residential area, industrial, recreational activities, agriculture and fishing in Selangor River.

ABSTRAK

Bakau adalah tumbuhan berkayu yang tumbuh di antara muka bumi dan laut di latitud tropika dan subtropika di mana mereka wujud dalam keadaan kemasinan yang tinggi, air pasang surut yang ekstrem, angin kencang, suhu tinggi, dan tanah anaerobik berlumpur. Objektif kajian ini adalah untuk menentukan pencemaran logam berat (Cu, Zn, dan Pb) yang terpilih di sedimen bakau di Sungai Selangor, Kampung Kuantan, Kuala Selangor dan membandingkan kandungan logam berat (Cu, Zn, dan Pb) di dalam hutan bakau antara plot yang berlainan dan kedalaman yang berbeza. Ciri-ciri fizikal (kelembapan tanah dan tekstur tanah) dan sifat-sifat kimia (pH air, kekonduksian elektrik tanah, logam berat (Cu, Zn, dan Pb) tanah ditakrifkan mengikut plot dan kedalaman. Data yang diperolehi dianalisis menggunakan perisian Statistical System Analysis (SAS) versi 9.4. Hasil kajian menunjukkan bahawa sedimen berada dalam tanah liat berpasir dan kelembapan tanah dengan semua plot dan pada semua kedalaman adalah tinggi. Kawasan bakau di Sungai Selangor mengandungi sedimen basah. Pencemaran tanah oleh logam berat dipengaruhi oleh banyak faktor termasuk pH tanah dan kekonduksian elektrik tanah (EC). Elemen Plumbum (Pb) dianalisa menggunakan Plasma Diguna secara Induktif (ICP). Elemen Tembaga (Cu) dan Zink (Zn) pula menggunakan Spektrometer Penyerapan Atom (AAS). Pencemaran sedimen dengan Zn adalah lebih tinggi dalam semua plot dan pada semua kedalaman daripada Cu dan Pb. Logam berat Tembaga (Cu), Zink (Zn) dan Plumbum (Pb) didapati dalam semua plot dan pada semua kedalaman. Sedimen di semua plot dan pada semua kedalaman dicemari dengan logam berat ini kerana kawasan kediaman, perindustrian, aktiviti rekreasi, pertanian dan perikanan di Sungai Selangor.

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Thank you.

APPROVAL SHEET

I certify that this research project report entitled “Heavy Metals (Copper, Zinc, and Lead) in Mangrove Sediment at Selangor River, Kampung Kuantan” by Ahmad Nur Syahmi Bin Zainal has been examined and approved as a partial fulfilment of the requirements for the Degree of Bachelor of Forestry Science in the Faculty of Forestry, Universiti Putra Malaysia.

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Assoc. Prof Dr. Seca Gandaseca
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Date: JANUARY 2019

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LIST OF ABBREVIATIONS

Pb	Lead
Zn	Zinc
Cu	Copper
SM	Soil Moisture
EC	Electrical Conductivity
AAS	Atomic Absorption Spectrometer
ICP	Inductively Coupled Plasma
SAS	Statistical Analysis System

CHAPTER 1

INTRODUCTION

1.1 General Background

Mangrove forests are distributed in the inter-tidal region between the sea and the land in the tropical and subtropical regions of the world. The forests are typically distributed from mean sea level to highest spring tide (Alongi, 2009). They grow in harsh environmental settings such as high salinity, high temperature, extreme tides, high sedimentation and muddy anaerobic soils. The mangrove forests of the world is less than half of what it once was (Spiers, 1999). Coastal habitats across the world are under heavy population and development pressures, and are subjected to frequent storms. Mangroves are more widespread on the west coast of Peninsula Malaysia than the east coast. This may be due to the different wave patterns of water bodies bordering the east and west coasts of the peninsula. The west coast is bordered by the Straits of Malacca that has a limited wind fetch and is thus relatively calmer while the eastern side of Peninsula Malaysia is bordered by the South China Sea that has larger and more energetic waves (Mohd Lokman and Yaakob, 1995).

In Malaysian mangroves support variety of endangered species of wildlife such as proboscis monkey *Nasalis larvatus*, estuarine crocodile *Crocodylus porosus,* fireflies *Pteroptyx tener* as well as many other highly specialized species whose survival depends on the existence of the mangrove ecosystems.

Mangrove forests are among of the most productive and biologically important ecosystems of the world because they provide important and unique ecosystem goods and services to human society and coastal and marine systems. Mangrove forests play a hugely important role in coastal community development and in maintaining the coastal environment. The devastating impact of a tsunami and storm surge by decreasing their wave energies can be reduce with wide, elongated, dense, and mature mangrove forests growing along the shoreline (Osti *et al*., 2009).

Sediments are defined as the organic and inorganic materials are found at the bottom of the water body. Sediment is the loose sand, clay, silt and other soil particles. Sediment is the amassing of residue such as rock, sand in a stream, lake or other marine environment (Ellison, 1999). Sediments can become contaminated in a number of ways. Heavy metals are including contaminated of sediment. Agricultural runoff may contain nutrients and pesticides. Industrial spills and releases, especially those that occurred before controls were in place, can put product into the water. Atmospheric deposition of substances such as mercury is another source of sediment contamination as is the discharge of contaminated groundwater through the sediments to the overlying surface water (Ellison, 1999).

Although there is no clear definition of what a heavy metal is, density is in most cases taken to be the defining factor. Heavy metals are thus commonly defined as those having a specific density of more than 5 g/cm^3. Heavy metals are present in streams as a result of chemical leaching of bed rocks, water drainage and runoff from the banks, and discharge of urban and industrial wastewaters. Sediments have been widely used as environmental indicators and their ability to trace contamination sources and monitor contaminants is largely recognized. There are play important roles in the assessment of metal contamination in natural waters (Islam and Nahar, 2010).

1.2 Problem Statement

Heavy metals pollution in sediment happens because excesses of heavy metals. The contamination become higher because of solid and liquid wastes emanating from the industrial activities contain toxic chemicals such as chromium salts, sulphides and other substances including heavy toxic trace metals (Rahimah, 2012).

The release of contamination into the river by human activities that can make effect to the Berembang trees, *Sonneratia caseolaris* and fireflies*, Pteroptyx tener*. In fact, there are huge area of oil palm plantation around the mangrove area. It will become a very serious problem to mangrove environment. Many activities that happen along the river at Kampung Kuantan everyday such as, recreational, industrial and villagers activities that may affect the heavy metal contamination in sediment. There also have a residential area surrounding the mangrove forest. The heavy metal comes from anthropogenic influences and source around the mangrove area such as agriculture, residential area, industrial and recreational activities, garbage and trashes that had been thrown by the people and usage of boats. The site area and three types of heavy metal is chosen as there is not enough energy, time and budget to do in a large area and many heavy metals. Various contaminates arising from lithogenic and anthropogenic sources influenced estuarine and coastal areas. Population growth and social economic activities including industry, agriculture and aquaculture exacerbate pressures on the environment by producing large quantities of wastewater that contain metals, radionuclides, metalloids, as well as organic pollutants and nutrients.

1.3 Objectives

The objectives of this study were

i. To determine the selected heavy metals (Cu, Zn, and Pb) contamination in mangrove sediment at Selangor River, Kampung Kuantan, Kuala Selangor.

ii. To compare heavy metals (Cu, Zn, and Pb) content in mangrove sediment between different plots and different depths.

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