

UNIVERSITI TEKNOLOGI MARA

**REMOVAL OF LEAD FROM AQUEOUS
SOLUTION USING EXOSKELETON OF BLACK
SOLDIER FLY (BSF)**

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Project submitted in fulfilment of the requirements for degree of
Bachelor in Environmental Health and Safety (Hons.)

Faculty of Health Sciences

January 2023

ACKNOWLEDGEMENT

In the name of Allah, The Most Gracious, The Most Merciful.

First and most of all, I am incredibly grateful to Allah S.W.T The Supreme Lord of the Universe, and his holy messenger, Prophet Muhammad S.A.W for bestowing upon me, strength, and good health to finish this dissertation. Without his graces and blessings, this dissertation would not have been possible.

This dissertation can be finished and becomes reality with the kind, help, and support of many individuals. I would like to express my deepest appreciation to all those who provide me with the possibility to complete this study. Above all, I would like to thank my parents, En. Zainudin Bin Ibrahim and _____ for their encouragement and support to complete this study.

This study would not be possible without the guidance, support, and patience of my supervisor, En. Razi Ikhwan Bin Md. Rashid, not to mention his advice and incomparable knowledge of Environmental Health and Safety. Additionally, I want to express my thankfulness for Dr. Ahmad Razali Bin Ishak's wise counsel, which has been of immense value to me.

I also want to extend my sincere gratitude to all the lecturers and staff from the laboratory in the Department of Environment Health and Safety, Faculty of Health Sciences for the knowledge, advice, assistance, and full cooperation in many ways throughout my study in UiTM Puncak Alam.

My thanks and appreciation also go to all my friends for all their involvement, support, and enthusiasm in finishing this study. Not forgetting, everyone else who has willingly helped me out with their abilities. Thank you.

Last but not least, I want to thank me for believing in me, for doing all the handwork, for having no days off and for never quitting throughout the journey. Alhamdulillah, I made it.

TABLE OF CONTENTS

TITLE PAGE	
DECLARATION BY STUDENT	i
INTELECTUAL PROPERTIES	ii
APPROVAL BY SUPERVISOR	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF ABBREVIATIONS	xiii
ABSTRACT	xvi
ABSTRAK	xvii
CHAPTER 1: INTRODUCTION	1
1.1 Background	1
1.2 Problem statement	3
1.3 Research objectives	7
1.3.1 General objective	7
1.3.2 Specific objectives	7

ABSTRACT

Heavy metal pollution in the environment from the rapid industrialization and urbanization has had a devastating consequences on all types of biological forms, either directly or indirectly. The adsorption method is one of the most popular and promising approaches due to its simplicity, low cost, and potential for reuse. In this study, the effect of experimental conditions on the adsorption of plumbum in batch system using the black soldier fly (BSF) exoskeleton. This biomaterial was selected because it has been widely used in small-scale waste management projects now days which contain chitin that plays an important role in adsorption of heavy metals. The adsorption of plumbum was found to be dependent on the initial pH, adsorbent dosage, initial concentration of plumbum and contact time. The adsorption process efficient in the basic pH region (11), adsorbent dosage (0.4 g), initial concentration (6.0 mg/L) and contact time (150 mins). It shows that the Freundlich isotherm is better in describing the adsorption process, with adsorption capacity of plumbum was 1.15247 mg/g meanwhile for kinetic models, pseudo-second-order model providing the best fitting of the experiment to describe the adsorption behaviour. It was discovered that the multilayer adsorption occurred between the BSF and plumbum as well as absorbed onto the heterogenous of available active sites. Thus, the BSF can be applied as cost effective removal of plumbum from real water samples due to their high capability.

Keywords: *Black soldier fly, adsorption, plumbum, isotherm, kinetic*

CHAPTER 1

INTRODUCTION

1.1.1 Background

Increased demand for water, which is necessary to support all living forms on this blue planet, is a result of the population growth that is creating rapid expansion in the agricultural and industrial sectors. On top of that, the quantity and quality of drinkable water have significantly declined due to rising water pollution brought on by waste discharged from a variety of industries, households, municipalities, and other sectors (Ahmed *et.al.*, 2021). Additionally, Hanna (2021), stated that more than 80% of all wastewaters generated by industry, households, cities, and agriculture is released into the environment without adequate treatment and then seeps back into the ecosystem through lakes, rivers, and other bodies of surface water. Daily, this process takes place all over the world, contaminating the environment and wasting essential nutrients and other recoverable resources. Besides, Ali *et.al.*, (2019), mentioned that heavy metals pollution is one of the significant issues facing in the modern human society since they endanger the environment and are extremely concerning. Heavy metal poisoning in the environment has resulted from rapid industrialization and urbanization, and their rates of mobilization in the environment have dramatically increased since the 1940s.

Zhou *et.al.*, (2021) mentioned that numerous sectors, including electroplating, printing, and dyeing, oil painting, electrolysis, insecticides, and medicine, employ heavy metals extensively. Because of these numerous sectors, different of organic and inorganic contaminants are present in the industrial discharge. Heavy metals are among of these contaminants which can be poisonous or carcinogenic are hazardous to people and other living creatures (Renu *et.al.*, 2017). In the mining, chemical, and metal-finishing industries, heavy metals like cadmium (Cd), lead (Pb), zinc (Zn), nickel (Ni), copper (Cu), and chromium (Cr) or their derivatives have been widely