

EFFECT OF CADMIUM (Cd) ON IN VITRO
CULTURES OF *Cryptocoryne elliptica*

SALIZA BINTI MOHD SUBEKHI

FAKULTI SAINS DAN TEKNOLOGI
UNIVERSITI SITI MALAYSIA TERENGGANU
2007

1100051173

Perpustakaan Sultanah Nur Zahirah (UMT)
Universiti Malaysia Terengganu



LP 60 FST 2 2007



1100051173
Effects of cadmium (Cd) on in vitro cultures of *Cryptocoryne
elliptica* / Saliza Mohd Subekhi.

PERPUSTAKAAN
UNIVERSITI MALAYSIA TERENGGANU (UMT)
21030 KUALA TERENGGANU

1100051173		

Lihat sebelah

HAK MILIK
PERPUSTAKAAN UMT

EFFECT OF CADMIUM (Cd) ON IN VITRO CULTURES OF *Cryptocoryne elliptica*

By

Saliza Binti Mohd Subekhi

Research report submitted in partial fulfillment of
the requirements for the degree of
Bachelor of Science (Biological Sciences)

Department of Biological Sciences
Faculty of Science and Technology
UNIVERSITI MALAYSIA TERENGGANU
2007

1100051173

This project should be cited as:

Saliza, M. S. 2007. Effect of Cadmium (Cd) on in vitro cultures of *Cryptocoryne elliptica*. Undergraduate thesis, Bachelor of Science (Biological Sciences), Faculty of Science and Technology, Universiti Malaysia Terengganu , Terengganu.

No part of this project report may be produced by any mechanical, photographic, or electronic process, or in the form of phonographic recording, nor may it be stored in a retrieval system, transmitted, or otherwise copied for public or private use, without written permission from the author and the supervisor(s) of the project.



JABATAN SAINS BIOLOGI
FAKULTI SAINS DAN TEKNOLOGI
UNIVERSITI MALAYSIA TERENGGANU

**PENGAKUAN DAN PENGESAHAN LAPORAN
PROJEK PENYELIDIKAN I DAN II**

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: **EFFECT OF CADMIUM (Cd) ON IN VITRO CULTURES OF *Cryptocoryne elliptica*** oleh **Saliza Binti Mohd Subekhi**, no. matrik:UK10594 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Biologi sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda Sains (Sains Biologi), Fakulti Sains dan Teknologi, Universiti Malaysia Terengganu.

Disahkan oleh:




Penyelia Utama

Nama:Dr.Aziz Bin Ahmad

Cop Rasmi:

DR. AZIZ AHMAD
Pensyarah
Jabatan Sains Biologi
Fakulti Sains dan Teknologi
Universiti Malaysia Terengganu
21030 Kuala Terengganu.

Tarikh:



Ketua Jabatan Sains Biologi

Nama:Dr. Aziz Bin Ahmad

Cop Rasmi:

DR. AZIZ BIN AHMAD
Ketua
Jabatan Sains Biologi
Fakulti Sains dan Teknologi
Universiti Malaysia Terengganu
21030 Kuala Terengganu

Tarikh: 9/5/2022

ACKNOWLEDGEMENT

First of all, thanks to Allah for giving me strength and from His blessing that make my work was successfully complete although there were many challenges during my work.

I would like to thanks my supervisor, Dr. Aziz Bin Ahmad for his guidance and taught in my project research. Secondly, to all laboratory assistant in Biotechnology and Biochemical laboratory for helping and prepare all the materials in lab.

Unforgettable to my beloved family for their continuous pray an to all friends in biological course as their co-operation during my project.

TABLE OF CONTENTS

ACKNOWLEDGEMENT	i
LIST OF TABLES	iv
LIST OF FIGURES	v
LIST OF ABBREVIATIONS	vi
LIST OF APPENDICES	vii
ABSTRACT	viii
ABSTRAK	ix
CHAPTER 1 INTRODUCTION	
1.1 Study Background	1
1.2 Objectives of study	3
CHAPTER 2 LITERATURE REVIEW	
2.1 <i>Cryptocoryne</i>	4
2.1.1 <i>Cryptocoryne elliptica</i>	5
2.2 Cadmium (Cd)	5
2.3 The Source of heavy metal cadmium (Cd)	6
2.4 Effect of cadmium (Cd) in human	7
2.5 Phytoremediation	8
2.6 Heavy metal uptake by plant	9
2.7 Heavy metal detoxification by plant	10
2.7.1 Phytochelatin (PC)	11
CHAPTER 3 METHODOLOGY	
3.1 Plant materials and media preparation	12
3.2 Experiment in-vitro	12
3.3 Extraction of Cadmium (Cd) in <i>C. elliptica</i>	12

3.4 Determination of Cadmium (Cd) uptake	13
3.5 Determination of protein content	13
3.6 Statistical analysis	13
CHAPTER 4 RESULTS	
4.1 Soluble protein content	14
4.2 Cadmium (Cd) content in tissues	15
CHAPTER 5 DISCUSSION	17
CHAPTER 6 CONCLUSION	19
REFERENCES	20
APPENDIX	22
CURICULUM VITAE	24

LIST OF TABLES

TABLE		PAGE
4.1	The amount of soluble protein content of different parts of <i>C. elliptica</i> culture in cadmium (Cd) of different time exposure periods (Data are mean \pm SE)	14
4.2	The amount of cadmium (Cd) accumulation of different parts of <i>C. elliptica</i> culture in cadmium (Cd) of different time exposure periods (Data are mean \pm SE)	15

LIST OF FIGURES

FIGURE		PAGE
4.1	The amount of soluble protein content and cadmium (Cd) accumulation in leaves	24
4.2	The amount of soluble protein content and cadmium (Cd) accumulation in petioles	24
4.3	The amount of soluble protein content and cadmium (Cd) accumulation in roots	24

LIST OF ABBREVIATIONS

CdCl ₂	Cadmium chloride
μM	micro molar
mg	milligram
μg	micro gram
g	gram
NaOH	Sodium hydroxide
HCl	Hydrochloric acid
ICPMS	Inductively Coupled Plasma Mass Spectrometer
Cd	Cadmium
Pc	Phytochelatin
°C	degree Celsius
rpm	rotate per minutes
μL	micro liter
BSA	Bovine Serum Albumin
±	Plus minus

LIST OF APPENDICES

APPENDIX		PAGE
1.	B5 media preparation	26
2.	ICPMS machine	27
3.	The culture of explants	27
4.	The contamination of culture	27

ABSTRACT

The use of plants to clean and minimized the accumulation of heavy metals in contaminated site has generated much interest of researchers. In this study, the ability of Cadmium (Cd) in *Cryptocoryne elliptica* was investigated and also the soluble protein content. In vitro plantlets of *Cryptocoryne elliptica* were exposure with 200 μ M cadmium for 30 days. The cadmium uptake was measured by using Inductively Coupled Plasma Mass Spectrometer (ICPMS) in every 5 days. Cadmium accumulation generally increases with increasing of exposure periods. Roots content the highest amount of cadmium compared to leaves and petioles which was 1.24-folds and 1.73-folds respectively. Roots was the highest part in soluble protein content which was 1.07-folds and 1.10-folds compared to leaves and petioles. Cadmium found to increase the soluble protein content in plantlets especially in roots.

Kesan logam kadmium (Cd) di atas kultur *Cryptocoryne elliptica* in vitro

Abstrak

Penggunaan tumbuhan untuk membersihkan dan mengurangkan pengumpulan logam berat di dalam kawasan yang tercemar telah mencetuskan banyak minat dikalangan penyelidik. Kajian ini telah mengenalpasti kebolehan pengumpulan logam kadmium (Cd) dan juga kandungan protein ke atas kultur *Cryptocoryne elliptica*. Plantlet *Cryptocoryne elliptica* in vitro telah didedahkan dengan 200 μ M kadmium selama 30 hari. Pengambilan kadmium telah diukur menggunakan mesin Inductively Coupled Plasma Mass Spectrometer (ICPMS) setiap 5 hari. Secara umumnya, pengumpulan kadmium adalah meningkat dengan meningkatnya tempoh pendedahan kultur. Akar mengandungi kadar kadmium tertinggi berbanding daun dan petiol di mana 1.24 lipatan ganda dan 1.73 lipatan ganda masing-masingnya. Akar merupakan bahagian yang mengandungi kandungan protein iaitu 1.07 lipatan ganda dan 1.10 lipatan ganda berbanding daun dan petiol. Kadmium telah ditemui meningkatkan kandungan protein di dalam plantlet terutama di dalam akar.