

**CONCENTRATION OF COPPER, ZINC, CADMIUM AND
LEAD IN SELECTED HERBS**

NIK NABIHAH HANIM NIK EFFENDI

**BACHELOR OF SCIENCE (Hons.) CHEMISTRY
FACULTY OF APPLIED SCIENCES
UNIVERSITI TEKNOLOGI MARA**

JANUARY 2017

ABSTRACT

CONCENTRATION OF COPPER, ZINC, CADMIUM AND LEAD IN SELECTED HERBS

It is very obvious that herbs are sources that are used since many years ago until now. This is because herbs have many purpose such as in cooking, perfumes, disinfectant and most important is use as a natural medicine. In the current study, the concentration of some essentials and non-essentials heavy metals such as zinc (Zn), copper (Cu), lead (Pb) and cadmium (Cd) exist in selected herbs that were bought from the local markets were analysed using Atomic Absorption Spectroscopy (AAS) after using dry ashing as a treatment method. Selected herbs consist of *Zingiber officinale* (ginger), *Curcuma longa* (turmeric) and *Alpinia galangal* (galangal). The concentration ranges for the heavy metals were found to be 0.221-0.442 mg/kg, 0.008-0.064 mg/kg, below detection limit (BDL)-0.136 mg/kg and 0.006-0.083 mg/kg for Zn, Cu, Pb and Cd respectively. Concentration for heavy metals analysed were below the permissible limit that recommended by Malaysian Food Regulation (1985). The Hazard Index (HI) for all heavy metals was found to have the value less than 1. HI value for *Zingiber officinale*, *Curcuma longa* and *Alpinia galangal* were 2.02×10^{-5} , 6.85×10^{-5} and 6.85×10^{-5} respectively. Thus, the daily intake will not expose any risk to the consumers if the concentration of heavy metals is concerned and there is no non-carcinogenic risk from the digestion of these four metals individually.

TABLE OF CONTENTS

	PAGE
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVEATIONS	viii
ABSTRACT	xi
ABSTRAK	xii
CHAPTER 1: INTRODUCTION	
1.1 Background study	1
1.2 Problem statement	2
1.3 Significance of study	3
1.4 Objectives of study	4
1.5 Scopes and limitation of study	4
CHAPTER 2: LITERATURE REVIEW	
2.1 Heavy metals	5
2.2 Copper	6
2.3 Zinc	7
2.4 Cadmium	8
2.5 Lead	9
2.6 Herbs	10
2.6.1 <i>Zingiber officinale</i> (Ginger)	11
2.6.2 <i>Curcuma longa</i> (Turmeric)	12
2.6.3 <i>Alpinia galanga</i> (Galangal)	13
2.7 Health risk assessment	14
CHAPTER 3: METHODOLOGY	
3.1 Materials	16
3.1.1 Raw materials	16
3.1.2 Chemicals and reagents	16
3.1.3 Glassware and apparatus	17
3.1.4 Equipment and analytical instrument	17
3.2 Collection of herbs samples	18
3.3 Sample treatment	18
3.4 Sample preparation	19
3.5 Analysis using AAS	19
3.6 Quality assurance	20
3.7 Health risk assessment (HRA)	20

CHAPTER 4: RESULTS AND DISCUSSION	
4.1 Concentration of heavy metals in selected herbs	23
4.2 Comparison with permissible limit	25
4.2.1 Zinc	25
4.2.2 Copper	26
4.2.3 Lead	28
4.2.4 Cadmium	29
4.3 Health risk assessment (HRA)	30
CHAPTER 5: CONCLUSION AND RECOMMENDATIONS	33
CITED REFERENCES	34
<i>CURRICULUM VITAE</i>	40

LIST OF FIGURES

FIGURE	TITLE	PAGE
2.1	<i>Zingiber officinale</i> (Ginger)	11
2.2	<i>Curcuma longa</i> (Turmeric)	13
2.3	<i>Alpinia galanga</i> (Galangal)	14
4.1	Average concentration of metals in herbs	24
4.2	Concentration of Zn in selected herbs	26
4.3	Concentration of Cu in selected herbs	27
4.4	Concentration of Pb in selected herbs	29
4.5	Concentration of Cd in selected herbs	30