

**HEAVY METAL DETERMINATION IN SELECTED MALAYSIAN
GROWN LEAFY VEGETABLES**

NORIHAYANI BT ISMAIL

**BACHELOR OF SCIENCE (Hons.)
FACULTY OF APPLIED SCIENCES
UNIVERSITY TEKNOLOGY MARA**

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ABSTRACT

HEAVY METAL DETERMINATION IN CERTAIN MALAYSIAN GROWN LEAFY VEGETABLES

This study investigated the levels of six different heavy metals (Zn, Cu) which are essential and toxic metal (Cd, Cr, Pb, As) in three types of Malaysian grown leafy vegetables including leaves and stems of water spinach (*Ipomoea aquatica*), mustard green (*Brassica juncea*) and spinach (*Spinacia oleracea*). Heavy metals were extracted from vegetables using dry ashing method. ICP-OES was used to evaluate the levels of these metals in the vegetables. The results showed the following ranges (mg/kg): 0.053-0.058, 0.101-2.125, 27.786-83.306, 4.391-8.486 for cadmium, chromium, zinc and copper respectively. The highest mean concentration of Zn, Cu, Cr, Cd were detected in leaves of mustard greens, stems of water spinach, stems of mustard green and leaves of spinach. Heavy metals were the highest in leaves of mustard green compared to other type of vegetables. The study showed that heavy metals content in various parts of vegetables studied were still below the permissible levels by Malaysian Food Act 1983 (Act 281) & Regulations. Overall, this study indicates Malaysian grown leafy vegetables especially water spinach, spinach and mustard green obtained from Selayang market was safe to be consumed in terms of heavy metals.

CHAPTER 1

INTRODUCTION

1.1 Background

1.1.1 Vegetables

Vegetables are a form of plant matter that is normally eaten as a food. These consist of stem vegetables such as bamboo shoots and asparagus, root vegetables such as carrots and potatoes, leafy vegetables such as spinach and mustard green, and inflorescence vegetables such as broccoli and globe artichokes. A lot of herbs are highly flavorful vegetables. Vegetables are very important to human diet as they have essential components needed by the human body such as minerals and vitamins and that cannot be found in other kinds of foods. Carbohydrates and proteins can be easily found in other foods.

Spinach (*Spinacia oleracea*) is a flowering plant in the family of Amaranthaceae. It is an annual plant, which can grow to a height of up to 30 cm and may survive over winter in temperate regions. The leaves of spinach are ovate to triangular based alternate, simple, variable in size from