UNIVERSITI TEKNOLOGI MARA

DETERMINATION OF HEAVY METAL IN LEAFY AND FRUIT VEGETABLES FROM CONVENTIONAL FARMS IN KUALA SELANGOR DISTRICT

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

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DECLARATION BY STUDENTS

Project entitled "Determination of Heavy Metal in Leafy and Fruit Vegetables from Conventional Farms in Kuala Selangor District" is a presentation of our original research work. Whenever contributions of others are involved, every effort is made to indicate this clearly, with due reference to literature, and acknowledgement of collaborative research and discussions. The project was done under the guidance of Project Supervisor, Dr Nadiatul Syima Mohd Shahid. It has been submitted to the Faculty of Health Sciences in partial fulfilment of the requirement for the Degree of Bachelor in Environmental Health and Safety (Hons).

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

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ABSTRACT

Vegetables are food that unavoidable by human because it is an important component of a healthy and balanced diet. Fruits and vegetables are important components in human diet and they are rich sources of vitamins, minerals, fibers and antioxidants. However, the presence of heavy metals in fruits and vegetables may become risks to human health. *Spinacia oleracea* (spinach) and *Brassica juncea* (mustard) can be categorized as leafy vegetables while *Cucumis sativus* (cucumber) *and Capsicum annum* (chili) are classified as fruit vegetable. This study was conducted to determine the concentration of heavy metal for leafy (spinach and mustard) and fruit (cucumber and chili) vegetable from five conventional farms. Atomic Absorption Spectrometer (AAS) was used in detecting the concentration of heavy metals. Two different species for each type of vegetable were purchased randomly and analysed for selected heavy metals. Based on the analysis results, all the samples were detected with heavy metals. The results showed the mean concentration of heavy metals tested in spinach was Pb > Zn > Cu > Fe > Cd while for mustard was Zn > Pb > Fe > Cu > Cd. The mean concentration of heavy metals tested in cucumber was Fe>Zn>Cu>Pb>Cd while chili was Fe>Zn>Pb>Cu>Cd. One-way Anova analysis showed that only Pb and Zn had significant differences while Cu and Zn for leafy and fruit vegetable respectively. There was one parameter, Pb that exceeded WHO Standard for fruit vegetable and 2 parameters, Pb and Cd for leafy vegetable. However, 100% of fruit vegetable samples were below permissible limit set by the Malaysian Standard, Food Act 1983 and Food Regulations 1985. There was one parameter, Pb that exceeded Malaysian Standard, Food Act 1983 and Food Regulations 1985 for leafy vegetable. Pearson's test was conducted in identifying the association of concentration of heavy metal between vegetable and soil. There was positive strong association of Pb for spinach and mustard and Fe for cucumber and positive medium association of Pb and Fe for chili. Health Risk Assessment which were Total Hazard Quotient (THQ) and Hazard Index (HI) have been conducted for all samples. The THQ and HI of all the collected samples were less than 1 which showed that there were no adverse effects that can cause harm to the population expected to occur when being consumed. Regular monitoring is an important action to ensure they are not exceeding permissible limit recommended by Malaysian and WHO Standard

Keywords: *Spinacia oleracea*, *Brassica juncea*, *Cucumis sativus*, *Capsicum annum*, Heavy metals, accumulation, association, Health Risk Assessment)