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# The Assessment of Heavy Metals (Pb, Zn, Cu, Fe, Cd) in Selected Vegetables in Kota Bharu Kelantan

**Esther Boey Yann Synn, Nurul Izzah Abdul Samad**

Environmental and Occupational Health Program, School of Health Sciences, Universiti Sains Malaysia, Malaysia

*Corresponding author: izzahsamad@usm.my

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## Abstract

Most heavy metals are naturally occurring [1] and some are derived from human activities [2]. Because of the widespread dispersion of these heavy metals in Kelantan's soil [3-8], there is a need to monitor their amounts, particularly in foods. This is due to heavy metals in soil being taken up by crops via transfusion [9]. Heavy metals are biomagnified and bioaccumulated in the bodies of humans and animals who consume heavy metal-contaminated plants [10]. Hence, this study aimed to assess the heavy metals (Pb, Zn, Cu, Fe, Cd) in chili, cucumber, round cabbage, and okra.

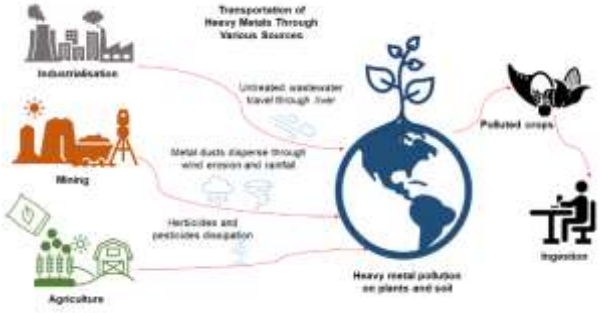


Figure 1: The flow diagram of the cause of heavy metal pollution on soil and plants

The samples were transported to the Environmental and Occupational Health Laboratory in Universiti Sains Malaysia Kubang Kerian using a cold box. The samples were cut into small pieces and oven-dried at 60˚C-70˚C for three days. The dried samples were then crushed into powder and processed using the acid-wet digestion method. Finally, the samples were analysed for the heavy metals' concentration (Pb, Zn, Cu, Fe, and Cd) using Graphite Furnace Atomic Absorption Spectroscopy (GFAAS). A Mann-Whitney U test was used to compare the heavy metals concentration in vegetables (chili and cucumber) between Kampung Binjai and Bunut Payung.

The result showed that chili in Kampung Binjai had a higher Pb (p=0.001) and Cd level (p=0.006); whereas cucumber in Bunut Payung had a higher Pb (p=0.001), Zn (p=0.002) and Cd level (p=0.002). The Kruskal Wallis test also showed that Zn (p=0.001), Cu (p=0.020), and Cd concentrations (p=0.001) were significantly different

among the vegetables. A posthoc test was performed to determine further the pairs of vegetables that were significantly different from each other. The heavy metals concentrations in the vegetable samples were then compared with the permissible limit set by the Food and Agriculture Organisation (FAO)/ World Health Organisation (WHO) and Malaysian Food Regulation 1985. Among all the vegetables tested, Pb concentration (mean ± SD) in chili (0.1189 mg/kg ± 0.02), round cabbage (0.06589 mg/kg ± 0.01) in Kampung Binjai, and cucumber (0.1564 mg/kg ± 0.06) and okra (0.0677 mg/kg ± 0.02) in Bunut Payung had exceeded the permissible limit set by the FAO/ WHO. However, the heavy metals in these vegetables were within the permissible limit set by Malaysia Food Regulation 1985.

Even though Pb concentration in some samples exceeded the standard level, most samples were safe to consume. However, traces of Pb and Cd are not supposed to be present in the vegetables. This is due to human body does not require these heavy metals, as they will harm the human body [11]. Therefore, various agencies should address this issue. Consumers should also be mindful of the consumption frequency and variation of vegetables, especially children, because they have a higher nutrient absorption capacity than adults and engage in the hand-to-mouth activity.

**Keywords**
Heavy metals, Kota Bharu, Vegetables

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