

QUANTIFICATION OF HEAVY METALS IN VEGETABLES IN DIFFERENT AREAS OF BOGURA DISTRICT AND THE ASSOCIATED HEALTH RISKS

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Extended Summary

The current study focused on quantifying hazardous heavy metals (Cu, Cr, and Pb) in soil-vegetable (potato, tomato, pepper, cauliflower, and cabbage) systems in different Upazilas of Bogura district to assess their impact on human health and the environment. The instrumental detection method was validated according to linearity, determination coefficient, LOD, LOQ, accuracy, and precision. All the vegetables and their field soil had Cu concentrations lower than the maximum permissible limit set by BFSa, FAO/WHO. The concentration of Cr and Pb in vegetables exceeded the maximum allowable limit, but their field soil in different upazillas of Bogura District did not exceed the maximum allowable limit as per FAO/WHO. For contamination factor (CF), only Pb severely contaminated the vegetables ($CF > 6$) produced in different Upazilas of the Bogura district. The contamination degree (CD) data also showed that all vegetables produced in the fields of different Upazilas of Bogura had severe contamination. The pollution load index (PLI) results indicated vegetable field soil of Kahaloo, and Bogura Sadar had the highest PLI, while the vegetables produced in Nandigram and Dupchanchia had the lowest PLI. The bioaccumulation factor (BF) values were found < 1 in all vegetables for Cu, Cr, and Pb indicating trace metal transfer from field soil to consumable parts. Furthermore, the potential ecological risk factor (ERi) by single metal and risk index (PERI) results revealed lower ecological risks in vegetable fields in different Upazilas of the Bogura district. Health risk assessment showed that all vegetable samples are unsafe for human consumption as the carcinogenic health risk ($CHR > 10^{-4}$) and non-carcinogenic health risk ($HI > 1$) quotients seem more than the safe level in all vegetable samples collected six Upazilas of Bogura district. Findings show that heavy metal concentrations are high in vegetable fields in different Upazilas of the Bogura district, endangering the environment and consumer health. So, action is needed to reduce heavy metal pollution in the vegetable fields of different Upazilas of Bogura district to protect the environment and the consumer's health.

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