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Analysis of the bacterial microbiome by PCR method and determination of Lead and Cadmium contents by Atomic Absorption Spectrometry in commercially available liquid organic fertilizers

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Due to the negative impacts caused by the extensive use of inorganic fertilizers, there is an increasing need for organic fertilizers to address environmental issues such as land degradation, eutrophication, and contamination. However, organic fertilizers may also contain heavy metals and other contaminants in addition to nutrients. Hence, it is crucial to examine the quality and suitability of organic fertilizers. The current investigation was focused to analyze the bacterial microbiome and the heavy metal content in three brands of commercially available liquid organic fertilizers (A, B, and C) in the Sri Lankan market. The fertilizer samples were cultured in a Liquid Broth (LB), and the bacterial DNA was extracted by the boiling method. PCR amplification was carried out with universal bacteria and *E. coli* primers followed by the Agarose Gel Electrophoresis. Universal bacteria DNA (371 bp) was detected for all three brands of fertilizers and *E. coli* DNA (101 bp) was detected only in one brand of fertilizers. Determination of heavy metals was achieved by open-vessel acid digestion of fertilizers. The concentrations of Lead (Pb) and Cadmium (Cd) in Liquid Organic Fertilizers were determined by the Standard Addition method using Flame Atomic Absorption Spectroscopy (FAAS), at wavelengths of 283.3 nm for Lead (Pb) and 228.8 nm for Cadmium (Cd), respectively. The concentrations of Lead (Pb) in the three fertilizer brands were 0.355 ± 0.004 mg/kg, 0.315 ± 0.004 mg/kg, and 0.363 ± 0.005 mg/kg, whereas the concentrations of Cadmium (Cd) were 0.011 ± 0.001 mg/kg, 0.013 ± 0.001 mg/kg, and 0.009 ± 0.001 mg/kg, respectively. The molecular analysis shows the presence of Universal bacteria and *E.coli* in fertilizers. The results of the heavy metal analysis confirmed that both Lead (Pb) and Cadmium (Cd) concentrations lie within the acceptable limits (Pb = 1.0 mg/kg, Cd = 0.5 mg/kg) as of SLS 1702:2021 for all three brands. Detection of *E.coli* may exert adverse effects on the environment as well as human health and the results of this study are of special scrutiny in the review of human health risk assessments. Thus, this study has significance in determining the quality of the liquid organic fertilizers available in the local market.

Key Words: Atomic Absorption Spectrometry, Boiling Method, Liquid Organic Fertilizers, Open Vessel Digestion, Polymerase Chain Reaction (PCR)

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