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Analysis of chlorpyrifos and dimethoate pesticide residue levels in bottled drinking water

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Pesticide misuse is of great concern, due to its adverse effects on the environment, such as contamination of ground water resources. This could be a major problem for the bottled drinking water industry, as ground water would be the water sources for most of its products. Pesticide residue levels in bottled drinking water is one of the parameters tested in the Sri Lanka Standard (SLS) 894 certification scheme. This scheme ensures that, the pesticide residue levels in these products are lower than the Maximum Residue Levels (MRLs) of pesticides in drinking water established by the World Health Organization (WHO). Therefore, consumers prefer SLS certified bottled drinking water, considering the detrimental effects of pesticide residues on human health. The objective of this study was to determine the residue levels of chlorpyrifos and dimethoate in the SLS uncertified brands of bottled drinking water available in the local market.

Although, a majority of the bottled drinking water in the market have the SLS certification, four SLS uncertified brands of bottled drinking water were found from different areas in the Colombo District. Chlorpyrifos and dimethoate are two of the most widely used organophosphorus pesticides in Sri Lanka and hence, were selected for this study. Liquid-liquid extraction has been applied successfully in the analysis of pesticides in drinking water and this technique was used in our study. Water samples were extracted with dichloromethane, the extracts were dried, evaporated to near dryness and the residues were dissolved in acetone. The acetone extracts were analyzed by GC/MS.

Recovery studies were carried out by spiking sample blanks (double distilled water samples) with chlorpyrifos and dimethoate standards to obtain concentrations of 0.001, 0.005, 0.01 ppm. Excellent average recoveries of 93 -100 % were obtained for all spiked concentrations. The Limit of Detection (LOD) with respect to chlorpyrifos and dimethoate was 0.07 ppb and 0.30 ppb while, the Limit of Quantification (LOQ) was 0.20 ppb and 1.00 ppb respectively. This method enables quantitative determination of both organophosphorous pesticides in water samples at concentration levels lower than the MRLs specified by the WHO for drinking water. Chlorpyrifos and dimethoate pesticides were not detected in any of the SLS uncertified bottled drinking water samples. Since the LOD values of the two pesticides are lower than the WHO guideline values of 30 ppb for chlorpyrifos and 6 ppb for dimethoate in drinking water, the samples are safe for consumption.

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