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Analysis of pesticides in water samples and removal of monocrotophos by γ-irradiation

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Abstract

The analysis of 20 organochlorine pesticides has been carried out in surface water samples collected from Peshawar, KPK, Pakistan, using SPME-GC-ECD method. This method showed good liner response with R^2 values in the range of 0.9933 to 0.9999 for all pesticides. Percent recoveries at 1 µg $L^{-}1$ for all the pesticides ranged from 89.9 to 106.1%. A total of 59 surface water samples were tasted for 20 organochlorin pesticides residues, of which, 37 samples were found contaminated with γ-BHC, 12 samples with β-BHC, 25 samples with heptachlor and 25 samples with aldrin with a maximum concentration of 0.092, 0.053, 0.089 and 0.036 µg L^{-1}, respectively. However other pesticides were found in lesser no. of water samples. The Gamma irradiation decomposition of monocrotophos aqueous solution at various concentrations (60-150 mg L^{-1}) were carried out and their removal efficiency was investigated. Gamma irradiation showed 100% degradation for a 60 mg L^{-1} solution at an absorbed dose of 1200 Gy. The dose constants investigated in this study ranged from 1.4×10^{-3} to 3.0×10^{-3} Gy^{-1}. The effect of saturated solutions of N_2 and N_2O, and radical scavengers such as *tert*-butanol, *iso*-propanol, H_2O_2, NO_3^- and NO_2^- on the degradation of monocrotophos were also studied. The results showed that degradation of monocrotophos mainly proceeded through oxidative •OH radical. The organic by-products were determined by UPLC/MS/MS and inorganic by-products NO_3^-, NH_4^+ and PO_4^{3-} were quantitatively determined by ion chromatography. A detail mechanism pathway of monocrotophos degradation by irradition has been developed.