

Degradation of monocrotophos in aqueous solution by gamma irradiation

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Monocrotophos is an organophosphorus compound and widely used in agriculture to control chewing, sucking and boring insects. The gamma irradiation decomposition of monocrotophos in aqueous solution was carried out on a laboratory scale and the removal efficiency of monocrotophos was investigated. Aqueous solutions of different concentrations of monocrotophos (60-150 mg L⁻¹) were irradiated through 125-1500 Gy. Gamma irradiation showed 100% degradation for a 60 mg L⁻¹ solution at an absorbed dose of 1200 Gy. The radiolysis of monocrotophos was pseudo-first order (decay) with respect to dose. The dose constants investigated in this study ranged from 1.4X10⁻³ to 3X10⁻³ Gy⁻¹. It is decreased with an increase in the initial concentration of monocrotophos. The effect of saturated solutions of N₂ and N₂O, and radical scavengers such as tert-butanol, iso-propanol, H₂O₂, NO₃⁻ and NO₂⁻ on the degradation of monocrotophos were also studied. The results showed that •OH radical was the significant radical in the degradation of monocrotophos, while the aqueous electron and H•, were played minor role in the degradation of monocrotophos. The organic by-products were determined by UPLC/MS/MS and inorganic by-products NO₃⁻, NH₄⁺ and PO₄³⁻ were quantitatively determined by ion chromatography. A detail mechanism pathway of monocrotophos degradation by irradiation has been developed.

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