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Photocatalytic degradation of monocrotophos using TiO_2 photocatalyst: identification of intermediates by chromatographic techniques and reaction pathway

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ABSTRACT

The present study deals with photocatalytic degradation of monocrotophos (Organophosphate pesticide), the identification of intermediates formed during the photocatalytic degradation, and reaction pathway involved during the process. Chromatographic techniques [gas chromatography/mass spectrometry (GC/MS) and liquid chromatography/ mass spectrometry (LC/MS)] have been used for identification of intermediates. The degradation of monocrotophos was carried out in the presence of TiO_2 and UV light in the aqueous solution. The rate of degradation was estimated from residual concentration spectrophotometrically. The effect of various parameters on the degradation of the pesticide has also been assessed. Nine intermediates have been identified on the basis of LC/MS and GC/MS analysis and the mechanistic pathway for photocatalytic degradation of monocrotophos has been proposed. The degradation of monocrotophos proceeds via cleavage of C-O bond, attack of $^{\bullet}OH$ radical at various positions and dealkylation of dimethyl phosphate moiety of the pesticide.

Keywords: Monocrotophos; Photocatalysis; P25; Mechanism; LC/MS; GC/MS

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