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ON THE PRESENCE OF ORGANOPHOSPHORUS PESTICIDES IN DRAINAGE WATER AND ITS REMEDIATION TECHNOLOGIES

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Abstract

This study was carried out to monitor the presence of organophosphorus in drainage water (Kafr El-Sheikh (Kotshinar Drainage), Fowa (Fowa Drainage No.11), Metobess (El-Hokss Drainage), Beila (Karakat Drainage), Balteem (Hafeer Shihabeldeen Drainage), Nashart Drainage and El-Hamoul (El-Hamoul Drainage) in Kafr-El-Sheikh Governorate, Egypt. Furthermore, the efficacy of chemical (advanced oxidation processes) and bioremediation (effective microorganisms) for chlorpyrifos removing in drainage water, was evaluated. The results showed the presence of several organophosphorus pesticides in all drainage water sampling sites. Chlorpyrifos was detected with high frequency relative to other detected organophosphorus in drainage water in Kafr-El-Sheikh Governorate. Nano photo-Fenton like reagent ($\text{Fe}_2\text{O}_3(\text{nano})/\text{H}_2\text{O}_2/\text{UV}$) was the most effective treatment for chlorpyrifos removal in drainage water followed by $\text{ZnO}(\text{nano})/\text{H}_2\text{O}_2/\text{UV}$, $\text{Fe}^{3+}/\text{H}_2\text{O}_2/\text{UV}$ and $\text{ZnO}/\text{H}_2\text{O}_2/\text{UV}$, respectively. Bioremediation of chlorpyrifos by effective microorganisms (EMs) removed 100% of the chlorpyrifos initial concentration (5mg/L) after 23 days of treatment. There is no remaining toxicity in chlorpyrifos contaminated-water after remediation on treated rats with respect to cholinesterase activity and histological changes in kidney and liver relative to control. Advanced oxidation processes especially with nanomaterials and bioremediation with effective microorganisms can be regarded as safe and effective remediation technologies for chlorpyrifos in drainage water.

Key words: degradation, pesticides, remediation, toxicity, water

Received: May, 2012; Revised final: May, 2013; Accepted: June, 2013

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