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Contamination of ground water in the Kalpitiya Peninsula, by widely used pesticides

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Usage of agro-chemicals such as pesticide and fertilizer has rapidly increased in the last few years in Kalpitiya peninsula. This has led to contamination of the environment including ground water sources with pesticide residues. Contamination is encouraged by application of over doses of pesticides at rates greater than the recharge rate of the aquifer and poor knowledge of farmers on safe application. Hence pesticide movement studies in this area are an urgent requirement. Pesticide residue level of Captan (P5), Chlorpyrifos (P4), Chlorothalonil (P3), Dimethoate (P1), Diazinon (P2), Edifenphos (P9), Fipronil (P11), Fenthoate (P10), Profenophos (P7), Oxyfluorfen (P8) Quinalphos (P6), Imidaclopride (P13), Carbaryl (P14), Carbofuran (P12) and its toxic metabolites of 3-hydroxycarbofuran (P16) and 7-hydroxycarbofuran (P15) were monitored in ground water. Three cultivated areas exposed to high pesticide applications were selected and seven wells including shallow wells (SW) and tube wells (TW) were selected from each site. Each well was monitored at four occasions. Samples were analysed by gas chromatograph (GC) with detectors of micro electron capture detector (μECD), nitrogen phosphorous detector (NPD) and by High Performance Liquid chromatograph (HPLC) with a UV/Visible detector. Limit of determination for each pesticide were (μg/L): P1 (0.05), P2 (0.04), P3 (0.03), P4 (0.02), P5 (0.05), P6 (0.05), P7(0.05), P8(0.02), P9(0.1), P10 (0.03), P11(0.03) P12(2.0) P13(0.8) P14 (1.8), P15(2.0) P16(1.0).

Out of the 84 samples of water collected on four occasions, which were analysed for 12 pesticides, one or two of the pesticides Chlorpyrifos, Dimethoate Diazinon and Oxyfluorfen were detected in 16 samples. High pesticide residue concentrations were detected in irrigation wells located in the middle of the cultivated field (7A, 4A, 11A). Shallow wells, which were located outside of the field where $L \geq 25$ m were not contaminated by even one pesticide. However estimated water consumption of these wells is very low. One tube well out of 7 (14%) was contaminated by Diazinon and Dimethoate. Estimated water consumption of that well was highest (50 m^3). Residue levels of Dimethoate have decreased rapidly more than residue levels of Chlorpyrifos throughout the monitoring period. Residues of Chlorpyriphos were detected at high frequency.

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