

Prediction of pesticide risk on ground water in the Kalpitiya peninsula using Pesticide Impact Ranking Index (PIRI)

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Systematic methods of the assessment of potential risk of pesticides to environmental components can serve as valuable tools in decision-making and policy formulation. Relative risk of pesticide on ground water was assessed using a software namely Pesticide Impact Rating Index (PIRI). It can be used to rank pesticides in terms of their relative pollution potential (PP) to ground water or surface water. When applied in Australia, PIRI has correctly estimated the PP of pesticides in greater than 80% of cases under case studies. In this study PIRI was used to rank frequently used pesticides such as Captan, Carbaryl, Carbofuran, Chlorfluazuron, Chlorothalonil, Chlorpyrifos, Diazinon, Dimethoate, Fenthion, Fenvalarate, Fipronil, Imidacloprid, Mancozeb, Metalaxyl, Permethrin, Phenthoate and Profenofos in the Kalpitiya area. Pesticides were ranked on the basis of mobility to ground water (GW) and toxicity to human being. PIRI uses environmental half-life of the pesticide ($t_{1/2}$), soil profile depth, recharge rate, residence time of the pesticide in depth of soil profile, retardation factor, volumetric moisture content of the soil at field capacity, to estimate concentration of pesticide in GW and it uses lethal dosage for rat as a toxicity parameter.

PIRI uses temperature, Irrigation and rainfall of pesticide treated areas and site conditions as environmental parameters. Also $t_{1/2}$ and organic carbon partition coefficient (K_{oc}) of pesticide, fraction of active ingredient, application frequency and rate of the product application are required as pesticides data.

PIRI estimation indicates that according to attenuation factor, Carbofuran is the most mobile pesticide. Dimethoate, Carbaryl, Diazinon and Fenthion are also extremely high mobile pesticides under the field conditions. All other pesticides indicate very low mobility.

According to PIRI toxicity index Carbofuran, Dimethoate and Diazinon create extremely high toxic effect on ground water. Also Fenthion and Carbaryl have fallen into high toxic category. However, predictions of PIRI module mainly depend on K_{oc} and $t_{1/2}$ collected from literature. But actual $t_{1/2}$ of a compound varies with lots of environmental conditions such as pH and microbiological activity of soil. Measurement of $t_{1/2}$ and K_{oc} of pesticides under different environmental conditions would help in accurate prediction.

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