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Desorption of Paraquat in Sri Lankan soil types

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The herbicide paraquat (1,1-dimehtyl-4,4'- bipyridinium dichloride) has been widely used in agriculture over more than hundred countries as a nonsystemic contact herbicide for many crops. It is important to monitor the fate of pesticides in the environment (especially soil and water) due to the heavy use of pesticides in the world today. A major part of a paraquat application, when it reaches the soil, it is strongly adsorbed. This is in equilibrium with an extremely low concentration in soil solution. However, Paraquat in soil solution is biodegradable and completely mineralized by soil microorganisms. Research studies related to fate of paraquat have been reported extensively by other countries for their environmental and soil conditions.

Although Paraquat is a heavily used pesticide in Sri Lanka, fate of paraquat in the environment (soil and water) has not been conducted to the best of our knowledge. This study was under taken to explore this aspect. Quantitative laboratory scale experiments have been carried out to obtain preliminary data of fate of paraquat such as apparent Distribution co-efficient, adsorption isotherms. In addition, desorption behavior of paraquat molecules was also explored, under dynamic conditions using two different agricultural soil types in Sri Lanka (Batalegoda and Gannoruwa). Dynamic experiment was conducted for the soil type of Batalegoda using six glass columns (diameter of 2 cm and height of 50 cm) filled with 100 g of soil (sieved and oven dried for 24 h at 100 ^{0}C), the flow rates (0.10, 0.15, 0.20,0.30,0.38,0.50 cm^3 min^{-1}) of water, which was added to measure the desorption amount of paraquat, were selected as desired. For the comparison purposes Apparent K_D (K_D = [Paraquat]$_{soil}$ / [Paraquat]$_{supernatant}$)of paraquat on Bentonite clay was also investigated. Quantitation of paraquat accomplished by using stearic acid modified glassy carbon electrode as reported earlier.

Mean apparent partition coefficients found to be 8.48 and 11.95 for Batalegoda and Gannoruwa soil types respectively. The Apparent K_D on bentonite clay was found to be 98.17. Furthermore, desorption quantity of the paraquat at water-saturated soil, was detected under six different flow rates

of water. It was found that more than 60% of paraquat could be eluted even at the slow flow rate of 0.10 cm^3 min^{-1}. This study suggested that according to texture of Sri Lankan soil type, heavy water pollution is possible with paraquat.

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