

was studied in batch mode experiments at $27 \pm 1^\circ\text{C}$ using a soil sample collected from Kaudulla rice fields in the Polonnaruwa district.

The adsorption kinetics of the rice soil-paraquat system was fast and was found to be second order ($k = 1.41 \times 10^3 \text{ mol}^{-1} \text{ ls}^{-1}$ for equimolar concentrations of soil and paraquat. Over 80% of paraquat uptake took place within 30 sec. The maximum adsorption capacity at pH 8.0 and at background ionic concentration of 0.001 M was 10.1 mg/g and this corresponded to only 15.7% of the total exchangeable sites. The adsorption equilibrium could be best described by the Langmuir isotherm model (equilibrium constant, $K=0.0512 \text{ mg/l}$). At paraquat concentration existing in the field immediately after application (5.3 ppm), the adsorption increased with increasing pH and decreasing background ionic concentration and, above pH 6.5, almost total uptake occurred. A 30% reduction in the organic carbon content of the soil reduced the amount of paraquat adsorbed by only 8% suggesting the minerals to be the predominant paraquat binding component of this soil. Under natural conditions of the rice field, paraquat was strongly bound to rice soil and, therefore, could not be displaced by high acidity (pH=2.3) or high background ionic concentrations (1 M NaNO_3).

At field application level, the residual paraquat remaining in aqueous phase after rapid equilibrium was less than 0.12 ppm. This residual concentration is insufficient to cause any lethal effect on fish or acute toxicity to human beings.