



Radiation Chemistry and the Environment: The Radiation Degradation of Pesticides

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The chemistry of the degradation of organic pesticides, herbicides and fungicides in natural systems determines operationally important parameters such as withholding times before planting or consumption. Free radicals are being increasingly recognised as important in environmental chemistry and in aqueous systems the OH, H, and O_2^- radicals are believed to be relevant to the degradation of organic molecules. Sources of these radicals in natural aqueous systems have been suggested as photochemical or transition metal reactions involving dissolved organic species such as humic acids.

We are undertaking a systematic study of the reactions of OH, H, and O_2^- radicals and halogen radical ions such as Cl_2^- , with important herbicides and fungicides in order to obtain rate constant data for modelling the possible reactions in field conditions and to establish whether the postulated reactions are capable of accounting for the disappearance of the materials in the environment. In addition to using gamma and pulse radiolysis to determine product yields, rate constants and the presence of reactive intermediates, we have begun to explore the stability and geometry of possible radical intermediates using Gaussian computations.

At present six pesticides in current use in Australia are being studied. Our results for one of these, Inoxy (I) will be discussed. While electron transfer to or from the molecule is the initial reaction path for OH and H radicals, superoxide radical species are unreactive.

