

Biodegradation Kinetics of 2,4-Dichlorophenoxyacetic Acid (2,4-D) in South Saskatchewan River Water

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Abstract

Biodegradation of the herbicide 2,4-dichlorophenoxyacetic acid (2,4-D) by a strain of *Pseudomonas* bacteria in surface water was monitored by high pressure liquid chromatography (HPLC). Two biodegradation experiments were completed using South Saskatchewan River water collected in the spring and summer of 1999 and amended with one of four initial 2,4-D concentrations. Each set of samples was also assessed under three different pH levels and dissolved organic carbon (DOC) contents to determine the effects of these parameters on the rate of substrate biodegradation.

First-order kinetics was observed in all successful biodegradation cases. Nutrient concentrations (including nitrate, ammonium, phosphate, and silicate), total organic carbon (TOC), colour, and other physical water quality parameters were evaluated at the start and end of each biodegradation experiment. DOC, pH, and heterotrophic and *Pseudomonas cepacia* populations were monitored more frequently. On average, an acclimation period of eighteen days was required before the onset of rapid 2,4-D biodegradation (half-life values consistently between 30 and 40 hours).

Autoclaved controls displayed insignificant losses indicating that all 2,4-D depreciation from the amended samples was due solely to biotic factors.