DIRECT AND INDUCED PHOTOLYSIS OF FOLIC ACID IN AQUEOUS SOLUTIONS

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Abstract. This study investigated the photochemical transformation of folic acid (FA) in aqueous solution under simulated solar irradiation, focusing on its direct and induced photolysis. Direct FA photolysis followed pseudo-first-order kinetics, with the apparent rate constant increasing supra-linearly with FA concentration ($n = 1.92 \pm 0.05$). The quantum yield was very low ($\Phi = 0.16 \cdot 10^{-5} – 2.57 \cdot 10^{-5}$), indicating inefficient direct photochemical transformation. In the presence of H_2O_2, FA degradation followed fractional-order kinetics ($n \approx 0.57$ for both FA and H_2O_2), consistent with a hydroxyl-radical-mediated mechanism. Hydrogen peroxide enhanced FA photodegradation by up to sevenfold at low FA concentrations, although it decreased with increasing FA concentration. Overall, direct photolysis contributed only marginally to FA degradation, whereas hydroxyl-radical-mediated oxidation was identified as the predominant transformation pathway under simulated solar irradiation.

Keywords: folic acid, direct photolysis, induced photolysis, hydroxyl radical, photodegradation kinetics.