A high-sensitivity chlorophyll fluorescence assay for monitoring herbicide inhibition of photosystem II in the chlorophyte *Selenastrum capricornutum*: Comparison with effect on cell growth

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With 9 figures and 3 tables in the text

Abstract: A pulse amplitude modulated fluorometer (PAM) was used to measure the chlorophyll fluorescence induction kinetics (OIDP). The increase of I level, recorded at two different excitation light intensities, was used to monitor atrazine, simazin, diuron and isoproturon. The methods used were applied to a sensitive chlorophyte, *Selenastrum capricornutum*. Concentrations of about 0.01 µM of diuron, 0.04 µM of isoproturon and atrazine and 0.08 µM of simazine can be detected significantly. I₅₀-values obtained by the most sensitive method, corresponding to an excitation light-intensity of 130 µmol photon·m⁻²·sec⁻¹, are 0.3 µM for atrazine, 0.5 µM for simazine, 0.05 µM for diuron and 0.2 µM for isoproturon. The inhibition of *S. capricornutum* growth over a 4 days period was also studied and the I₅₀ obtained were about 0.4 µM for triazines, 0.03 µM for diuron and 0.2 µM for isoproturon.

Introduction

Herbicides acting as inhibitors of photosystem II (PSII) of photosynthesis are still widely used in agriculture, since they provide a low-cost basal weed control. They include triazines (atrazine, simazine), phenylureas (diuron, isoproturon), triazinones, uraciles, phenolics and other chemical families. Many reports refer to the presence of PSII herbicides, principally atrazine, in freshwaters (Denoyelles et al. 1982, Jurgensen & Hoagland 1990, Beitz et al. 1994).

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