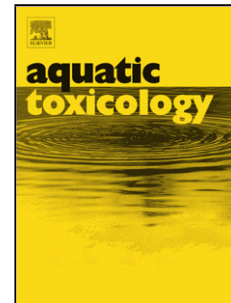


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The influence of natural dissolved organic matter on herbicide toxicity to marine microalgae is species-dependent

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Highlights

Two marine microalgae were exposed to irgarol, diuron and S-metolachlor and DOM.

Influence of natural DOM was evaluated on herbicide toxicity, singly and in mixtures.

Growth, photosynthetic efficiency and lipid content were influenced by herbicides.

Excreted molecules (quantity and composition) were influenced by herbicides.

Natural DOM modulated herbicide toxicity in a species-dependent way.

Abstract

Microalgae, which are the foundation of aquatic food webs, may be the indirect target of herbicides used for agricultural and urban applications. Microalgae also interact with other compounds from their environment, such as natural dissolved organic matter (DOM), which can itself interact with herbicides. This study aimed to evaluate the influence of natural DOM on the toxicity of three herbicides (diuron, irgarol and S-metolachlor), singly and in ternary mixtures, to two marine microalgae, *Chaetoceros calcitrans* and *Tetraselmis suecica*, in monospecific, non-axenic cultures. Effects on growth, photosynthetic efficiency (Φ'_M) and relative lipid content were evaluated. The chemical environment (herbicide and nutrient concentrations, dissolved organic carbon and DOM optical properties) was also monitored to assess any changes during the experiments.

The results show that, without DOM, the highest irgarol concentration (I0.5: 0.5 $\mu\text{g.L}^{-1}$) and the strongest mixture (M2: irgarol 0.5 $\mu\text{g.L}^{-1}$ + diuron 0.5 $\mu\text{g.L}^{-1}$ + S-metolachlor 5.0 $\mu\text{g.L}^{-1}$) significantly decreased all parameters for both species. Similar impacts were induced by I0.5 and M2 in *C. calcitrans* (around -56% for growth, -50% for relative lipid content and -28% for Φ'_M), but a significantly higher toxicity of M2 was observed in *T. suecica* (-56% and -62% with I0.5 and M2 for growth, respectively), suggesting a possible interaction between molecules.

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