



Evaluation of acute toxicity of textile dye (reactive red 123) on *Chlorella vulgaris* and *Spirulina platensis*

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Abstract:

Microalgae are an ecologically important group of organisms in the aquatic environment due to their major role as primary producers. They are highly vulnerable to an array of stresses including different types of manmade chemical products, including textile dyes. Although many of textile dyes are known to be emerging environmental toxicants in aquatic environments, information on their toxicity on aquatic microalgae is limited. Therefore, the present study was designed to assess the stress responses of aquatic microalgae using *Chlorella vulgaris* (Green algae) and *Spirulina platensis* (Blue-green algae) against reactive red 123 (RR123) which is frequently used in textile industries. *C. vulgaris* and *S. platensis* were exposed to solutions with six concentrations (0 (control), 80, 120, 160, 200, and 240 mgL⁻¹) of RR123 dye. Each concentration with three replicates was exposed to the above two species for 96 hours following standard guidelines (Organization for Economic Co-operation and Development guidelines 201). At the end of the experiment, algae growth rate, growth inhibition, pigment contents (chlorophyll-a, chlorophyll-b, and carotenoids), H₂O₂ contents, and morphological changes of algae exposed to different concentrations were compared. A risk assessment was performed to determine the risk by using the EC₅₀ value. The highest growth rates of both algae were observed in the control groups, and growth rates decreased in a concentration-dependent manner where the lowest growth was exhibited in algae exposed to the highest dye concentration (240 mgL⁻¹). The EC₅₀ values for the toxicant were 122.21 and 71.91 mgL⁻¹ for *C. vulgaris* and *S. platensis* respectively. The pigment contents of both algae decreased with increasing the exposure level. After 96 hours of exposure, the EC₅₀ values for the toxicant's effect on chlorophyll-a, chlorophyll-b, and carotenoid of *C. vulgaris* were 99.5, 101.45, and 105.5 mgL⁻¹, respectively, while the same values of *S. platensis*, were 38.45, 38.5, and 39 mgL⁻¹ respectively. Present findings indicate that *S. platensis* is more vulnerable than *C. vulgaris* for RR123 dye, and their responses against the tested dye were species-specific. The findings of this study are important to clarify the interaction between textile dye waste and aquatic microalgae, and such information would benefit in formulating criteria for aquatic ecosystem management.

Keywords

Reactive red 123, specific growth rate, EC₅₀, *Chlorella vulgaris*, *Spirulina platensis*