

USE OF CHITOSAN IN THE ADSORPTION OF METALS IN SEDIMENTS FROM CONTAMINATED STREAMS: BIOREMEDIATION OF IMPACTED AREAS AND EFFECTS ON *CHIRONOMUS XANTHUS* LARVAE

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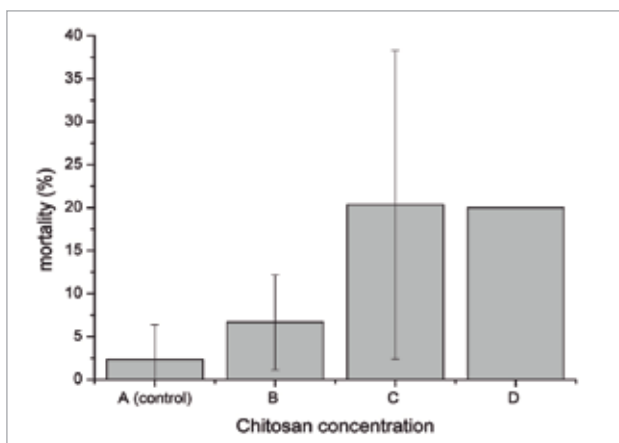


Figure 1. Acute toxicity test with different Chitosan concentration using sand sediments (A: without Chitosan; B: 0.1 mg.L⁻¹; C: 0.5 mg.L⁻¹; D: 1.0 mg.L⁻¹)

Streams located in areas near sugarcane cultivation receive high concentrations of fertilizers, containing metal ions, causing severe contamination in the aquatic sediment and accumulation in food chains. Chitosan, a biopolymer used in cosmetic formulations, as a food additive and in wastewater treatment, exhibits high affinity for metal ions. In this study, we evaluated the effects of solid chitosan on the larvae of *Chironomus xanthus* by carrying out chronic and acute toxicity tests, in order to evaluate its potential for use in remediation activities. The chitosan will be used in toxicity tests on larvae of *Chironomus xanthus* in order to adsorb the metals present in the streams sediment. Thus, knowing the amount of metals incorporated into larvae, as well as that found in the sediment, in experiments without the presence of chitosan and also in the presence of this biopolymer, can contribute to the knowledge on reducing the impacts of metals from the sugarcane cultivation to aquatic biota and the environment around you. Thus, this data could form the basis for establishing strategies for the restoration of degraded areas for sugarcane activity, devoid of riparian vegetation.

SUMMARY OF RESULTS TO DATE AND PERSPECTIVES

The acute toxicity tests, using sand sediments, pointed to low mortality of larvae of *C. xanthus*, especially when the chitosan concentration was 0.1 g.L⁻¹. At this concentration, the percentage of larval mortality was lower than the value considered being non-toxic and it was similar to mortality displayed in the control experiment (without chitosan). When the concentrations of chitosan were 0.5 g.L⁻¹ and 1.0 g.L⁻¹, the larval mortality was approximately 20%, showing evidence of little toxicity to aquatic biota. The results of chronic toxicity tests, using sand sediments, indicated low toxicity for two chitosan dilutions: 0.1 g.L⁻¹; 0.5 g.L⁻¹, especially by sand substrate, without organic matter content. Nevertheless, concentration of 1.0 g.L⁻¹ showed evidence of toxicity for aquatic biota. The analysis of chitosan metals complexation in larvae, using sand sediment, pointed to significant differences between the concentrations of metals in the experiment using 0.1 g.L⁻¹ and 1.0 g.L⁻¹ of chitosan (Figure 5). Especially with the concentration of 1.0 g.L⁻¹, values of Cd, Cu, Mn, Zn and Fe were significantly lower in larvae. Our study, using sterilized sand sediments, indicated the potential for the use of chitosan (in solid phase) in water systems, without causing the mortality and development of *C. xanthus* larvae. From the results obtained in the present study, we can infer that the use of chitosan in the concentration of 0.5 mg.L⁻¹ has also potential to be used in future in experiments on adsorption of metals in larvae of insects in contaminated environments.

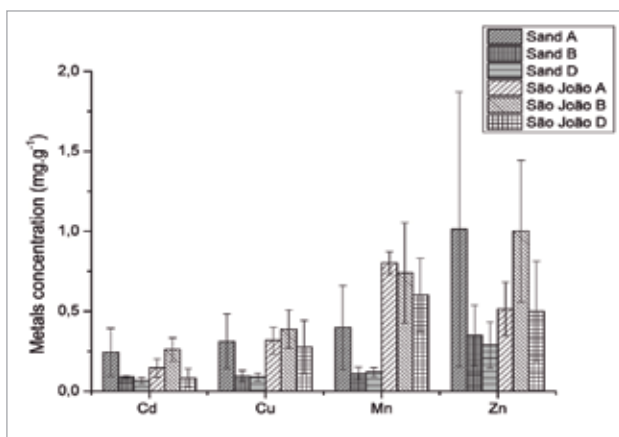


Figure 2. Mean values and standard deviations of metal concentrations detected in larvae (10 days test) using different chitosan concentrations with sand and contaminated sediments (São João stream) (A: without Chitosan; B: 0.1 g.L⁻¹; D: 1.0 g.L⁻¹)

MAIN PUBLICATIONS

Corbi JJ, Gorni GR, Correa RC. 2015. An evaluation of *Allonais inaequalis* Stephenson, 1911 (Oligochaeta: Naididae) as a toxicity test organism. *Ecotoxicology and Environmental Contamination*. **10**: 7-11.

Corbi JJ, Gorni GR, Campana-Filho SP, Correa RC. Toxicity of chitosan for *Chironomus xanthus* Rempel, 1939: assessment for the use in remediation activities. *Acta Limnologica Brasiliensia*. (submitted)

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