

TITLE: USE OF MICROALGAE FOR REMOVAL OF BIFENTHRIN IN NATURAL WATER

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ABSTRACT:

Pyrethroids are synthetic compounds used worldwide to control insect pests in agriculture. Bifenthrin is a third-generation pyrethroid insecticide with a strong environmental persistence and classify as moderately hazardous. After bifenthrin enter aquatic systems, it quickly dissipates from the dissolved water and bind to the organic carbon in sediments. In Rio Grande do Sul State, Brazil, tobacco is one of the most important culture in the region and bifenthrin is extensively used in this practice. Pesticides can caused several damages to the environment, such as soil and water sources contamination. Propagation occurs through the leaching of the soil by heavy rains and winds that can transport the pesticide to the water body. The bioremediation is in line with reducing the impact of pesticides, using biological agents to degrade chemicals. In general, the process consists of removing or reducing pollutants from the environment using living organisms. For this study, naturally occurring microalgae from Lago Dourado (natural water reservoir, located in Santa Cruz do Sul – Brazil) were used as bioremediation agents. In order to study the removal of bifenthrin, reactors systems of 125 mL glass containers were used. A standard solution of bifenthrin in water was added to each reactor (final water volume of 60 mL) to obtain a final concentration of 5 mg L⁻¹. The setup included a light incubator shaker (190 rpm) at 30 ± 2 °C with 12/12 hours light/dark photoperiod at a light intensity of approximately 1400 lux using cool-white fluorescent lamps. Microalgae reactors were inoculated with microalgae consortium obtained from Lago Dourado reservoir and were acclimatized for more than 8 months. The microalgae were inoculated to a concentration of approximately 1x10⁵ cel mL⁻¹. The experiments were run simultaneously for 10 days. Content of bifenthrin was determined by GC-MS using SPE for pre-concentration. The bioremediation process shows that residual bifenthrin concentrations were 9% lower in the microalgae system if compared to the reactor without microalgae. The process resulted in a total of reduction of 96% of bifenthrin concentration. This preliminary study shows that microalgae presence improve the removal of insecticide from water, being an alternative for removing pesticides in water. Further studies will determine to what extent this treatment can be applied and if there is bioaccumulation.

Keywords: bifenthrin, autochthonous microalgae, bioremediation, water

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