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ECOTOXICOLOGICAL ASSESSMENT OF WASTE TREATMENT OF ACID 3.5 DINITROSALICYLIC BY PHOTODEGRADATION

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3.5 Dinitrosalicylic acid (DNS or DNSA with formula C7H4N2O7) is an aromatic compound used in carbohydrates and enzyme assays. The aromatic ring in the structure makes their residue unsuitable for sewage disposal. Given the large volume of waste generated during analysis using DNS and the implication of its disposal, we propose a treatment through a photoreactor system (photolysis process) and an ecotoxicity assessment of wastes before and after this treatment. The ecotoxicity test proposed has terms based on the standard OECD201 (2006) and seeks to assess the toxic effects on a microalgae commonly found on water resources in the region, Pseudokirchneriella subcapitata (Chlorophyta), assisting in the evaluation of maximum concentrations for a safe disposal. The residue produced was assessed after quantification of carbohydrate activities in the Bioenergy Laboratory at Embrapa Agricultural Instrumentation (CNPDIA). The treatment of this waste by the process of photolysis used hydrogen peroxide at 30% in proportional volume to 2% of total volume. The system was kept at continuous recirculation for five hours by performing scans in the UV-visible spectrometer (600-200 nm) before, during and after the period of photolysis. Ultraviolet radiation provided by the lamps in system favors the photolysis of hydrogen peroxide, resulting in hydroxyl radical that reacts with the aromatic ring present in the molecular structure of the DNS. On the scan performed at baseline (0 hours), we observed a peak absorbance at a wavelength between 250-300 nm, characteristic of aromatic compounds. The scan performed at the end of treatment (5 hours) showed considerable decrease in absorbance (from 0.386 to 0.127). The photodegradation of the residue was also observed by its color, changed from an intense orange to yellow at the end of process. Thus, the treatment was effective, as there was disruption of the connections of the aromatic ring structure in the residue. In addition to treatment, the ecotoxicity test aimed to evaluate the rate of growth inhibition of a microalgae exposed to five different waste concentrations (treated and untreated) and a substance of known toxicity. The ecotoxicity test showed significant differences in growth inhibition when testing the residue before and after treatment. The sample with concentration of 0,81 ml/L of residue showed inhibition rate of 11,85% when untreated, while the treated sample showed 2,25% inhibition. Apparently the residue after treatment shows less inhibition of algal growth, which indicates a less toxic nature which meets the pattern observed in the UV-visible. Nevertheless, none of the tested concentrations approached the EC50, i.e. 50% inhibition of algal growth. Thus, other concentrations will be tested in order to assist in determining concentrations for safe disposal, even after treatment. Since it was not found in the literature treatment or safe disposal guidelines for this waste, this work becomes the first step to creating a standard protocol for DNS treatment and disposal. The authors thank Dr. Armando Augusto Vieira and technologist Antonio Luiz Sartori of the Botany Department / UFSCar, for providing the strain used in the study and Dr. Cristiane Farinas for providing the waste.

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