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PHOTODEGRADATION OF TEBUCONAZOLE IN AQUEOUS SOLUTION AND PHYTOTOXIC EFFECTS

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Abstract

Tebuconazole (TEB) is a fungicide largely used in agriculture that contributes to the environmental contamination of water resources, soil, and living organisms. Advanced oxidation processes (AOPs) are excellent tools to mitigate environmental contamination by TEB. Hence, this study aimed to evaluate the catalytic photodegradation of TEB in an aqueous solution using $TiO_2 \cdot SiO_2 \cdot AgNO_3$ as a catalyst and to evaluate the phytotoxic effects of its photoproducts. A factorial planning and response surface methodology was executed using a central composite model containing 2 variables (pH and catalyst concentration) in 5 levels, totaling 10 experiments. The analyses were performed in triplicate. The results showed better photodegradation efficiency at low catalyst concentrations and slightly acidic medium concentrations with photodegradation rates up to 84.96 %, or in the absence of catalyst and near photodegradation neutrality of 65.89 %. Thus, the experiments indicate the potential use of photolysis to degrade TEB without the use of catalysts and, in this way, develop a low-cost and environmentally friendly TEB degradation technique. The TEB and its photoproducts were phytotoxic for lettuce and onion seeds. However, it was non-phytotoxic for cucumber seeds even when there was photodegradation with UV irradiation and the presence of the photocatalyst. Hence, special attention must be given to the phytotoxicity effects of TEB when it is applied to the agricultural systems, avoiding the environmental contamination of the water resources, soil, and live organisms.

Keywords: bioindicators, catalyst, fungicide, germination index, photolysis

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