Sensitive voltammetric detection of mesotrione in environmental samples using a carbon black and quantum dots based sensor

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Mesotrione (MST) is a selective herbicide widely used in corn cultivation, effective in controlling broadleaf weeds [1]. Despite its agronomic benefits, the intensive use of MST can lead to environmental contamination, affecting soil, water resources, and food [2]. This underscores the need for sensitive, rapid, and low-cost analytical methods for detecting MST residues in environmental samples. This study reports the development and application of a simple, fast, and cost-effective voltammetric method for detecting MST at nanomolar concentrations. The technique employs a glassy carbon electrode modified with a mixture of carbon black (Printex L6) and quantum dots dispersed in a Nafion film. The electrochemical behavior of the sensor was evaluated using cyclic voltammetry, and MST quantification was performed by square wave voltammetry. The sensor exhibited a linear response in the concentration range of 0.020 to 3.5 μmol L^{-1}, with a detection limit of 5.4 nmol L^{-1}. The proposed sensor was successfully applied to the detection of MST in soil and river water samples, yielding recoveries close to 100%. These findings demonstrate that the proposed technique is a simple, rapid, and highly efficient alternative for the detection of MST in environmental samples.

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References:

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