POLYPHENOLOXIDASE-BASED BIOSENSOR FOR THE SCREENING OF CARBARYL IN ENVIRONMENTAL SAMPLES

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1. INTRODUCTION

Polyphenoloxidases (PPOs) are copper-containing enzyme that belongs to the group of oxidoreductases and catalyze the oxidation of mono-phenols and di-phenols to the corresponding *o*-quinones [1]. Carbaryl (CBR) is a highly toxic pesticide from the carbamate group, which affect the catalytic oxidation of phenolic derivatives by PPOs. For this reason, these enzymes have been used for the development of electrochemical biosensors, allowing a selective and/or quantitative information about this contaminant [2]. The aim of this study was to develop an electrochemical biosensor for CBR, using laccase (LACC) from *Trametes versicolor* as biorecognition element, with the future perspective of applying it in the monitoring of this pesticide in food samples.

2. METHODOLOGY

Electroanalytical experiments were carried out with a three-electrode system: a glassy carbon electrode modified with LACC (LACC/GCE) as working electrode; a platinum wire as counter electrode and a $Ag/AgCl/Cl^-_{sat}$ as reference electrode. The substrate used to study the enzymatic catalysis was 4-aminophenol (4-AMP) in 0.04 mol L^{-1} Britton-Robinson buffer (pH 5.0), so that the information were registered by cyclic (CV) and square-wave voltammetry (SWV), at 25ºC.

3. RESULTS

Using VC at 50 mV s^{-1}, the catalytic oxidation of 4-AMP substrate was assisted by the reduction of the quinone produced to its respective hydroquinone (Ep ≈ -0.1 V), which has

characteristics of an irreversible redox process. For electroanalytical purposes, the best operating parameters were concentration of the enzymatic solution of 10 U mL^{-1} and stabilization time of 15 minutes. CBR quantification was performed by SWV, using frequency of 100 Hz, amplitude of 40 mV and potential increment of 3 mV. Analytical curves were constructed with low dispersion of the data ($r > 0.998$), allowing a detection limit of 1.0×10^{-7} mol L^{-1}; suitable attributes of LACC/GCE for CBR electroassay. New tests will be conducted to evaluate the application of this device for the detection of this pesticide in food samples.

4. CONCLUSION

LACC/GCE showed suitable sensitivity to detect trace concentrations of CBR, so that it could be used as efficient electroanalytical device for the screening of this pesticide in food samples, with high precision and selectivity of the measurements.

REFERENCES

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