Applicability of a Voltammetric Method for the Determination of Electroactive Chlorpyrifos Pesticide in Food Samples

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Synthetic organophosphorus compounds are among the most toxic substances known and represent the largest class of insecticides widely used in agriculture. Chlorpyrifos is a member of organophosphorus class insecticides.

Chlorpyrifos analysis is carried out conventionally by gas chromatography by using NPD (1), ECD (2) and MS detectors (3). Liquid chromatography (HPLC) (4) and liquid chromatography determinations combined with ELISA is also reported (5). However, in developing countries the chromatographic analysis is financially prohibitive for these kind of analyses. Thus, development of reliable and fit for purpose methods of analysis for mixtures of pesticides with the use of simple and relatively inexpensive instrumentation is an appropriate objective. Hence, electroanalytical techniques provide an inexpensive alternative for pesticide analysis (6).

Chlorpyrifos (CP) is known to be electroactive and its differential pulse polarographic (DPP) behavior was investigated (7). In our study, differential pulse cathodic adsorptive stripping voltammetric behaviour of and of CP was studied. Effect of electrolyte, deposition time, deposition potential, temperature effect, pH effect, mercury drop dimension, sweep rate was the parameters optimized in our experiments.

The complex matrix of the food samples limits us to determine this pesticide without any pre-separation step. As we noticed from the literature, a single study includes the usage of SPE prior to the voltammetric analysis (8). The developed method was adopted for wine samples. The recovery of separation techniques were compared in our study. The main steps applied to wine sample before the voltammetric measurement is liquid-liquid extraction (LLE), separation on a coulumn (SPE) and concentration of the analyte. The effect of LLE solvent type and different coulumns were tested for the sample preparation step. Calibration curves were linear in a range of 0.2 - 200 ng/mL with the detection limit of 0.14 ng/mL and quantitation limit of 0.45 ng/mL. The RSD was calculated as 11% for 0.2 ng/mL concentration. The method was validated with spiked wine samples. The results were compared with GC-ECD.

References