

Optimization and validation of the kinetic spectrophotometric method for quantitative determination of the pesticide atrazine and its application in infant formulae and cereal-based baby food

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Abstract

BACKGROUND: Pesticides are potentially toxic to humans and can produce both acute and chronic health effects, depending on the quantity and the ways in which a person is exposed. Exposure to pesticides can cause serious health problems. Infants and young children are particularly sensitive to these contaminants because their brains and organ systems are not fully developed. For this reason, it is important to determine the quantities of pesticides in baby food.

RESULTS: The aim of this study was to develop a kinetic-spectrophotometric method for atrazine determination and to apply it to determine pesticide in baby-food samples, using solid-phase extraction (SPE) followed by the kinetic-spectrophotometric method and the high-performance liquid chromatography (HPLC) method. This method is based on the inhibition effect of atrazine (the oxidation of sulfanilic acid (SA) by hydrogen peroxide in the alkaline medium in the presence of the Co^{2+} ion). Under the experimental conditions used, atrazine showed a linear dynamic range of 0.5 to 5.0 $\mu\text{g mL}^{-1}$, and from 5.0 to 70.00 $\mu\text{g mL}^{-1}$ with relative standard deviations (RSD) from 1.91% to 9.41%. The limit of detection and the limit of quantification were 0.074 and 0.225 $\mu\text{g mL}^{-1}$, respectively. The kinetic method was successfully applied to determine the atrazine concentration in spiked samples after SPE of samples. High-performance liquid chromatography was used to verify the results.

CONCLUSION: The proposed method is highly sensitive, simple, easy, requires cheap reagents, and leads to good recovery levels. It is linear, precise, and accurate. It can be used successfully for the routine analysis of atrazine in infant formulae and cereal-based food samples.

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Keywords: atrazine; kinetic method; HPLC method; SPE; infant formulae; cereals baby foods

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