Development of a Gas Chromatographic Method for the Determination of Chlorpyrifos and its Metabolite Chlorpyrifos-Oxon in Wine Samples

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Many organophosphates readily undergo conversion from thion (P=S) to oxon (P=O) species. This reaction occurs in the environment under the influence of oxygen and light and in the body primarily by the action of liver microsomes [1]. Chlorpyrifos (CP) is an organophosphorus pesticide defined as an endocrine disruptor [2] that has been used extensively on grape to control various pests especially Lobesia Botrana [3]. This reaction also occurs for CP and transformation product CPO and this compound is about 3000 times more potent than CP in its inhibition of acetylcholinesterase, which leads to neurotoxicity [4]. CP is metabolized by oxidative desulphuration to oxon analog. (Figure-1) These compounds are biotransformed by different reactions that take place within the organisms such as a variety of hydrolyses and oxidations.

![Figure-1 Conversion scheme of CP to CPO](attachment://figure1.png)

In many routine food laboratories, the analytical studies focus on to actual pesticide compounds rather than their metabolites. However, the toxicological properties of some pesticides could remain in their metabolites and therefore, it is necessary to design efficient strategies for the investigation of pesticide metabolite [8]. These metabolites can also be produced as a result of pre-treatment during sample preparation step [9,10]. This study is focused on to develop a method for the determination of CP and its metabolite CPO.

A reliable, rapid method was developed for the determination of these analytes in wine sample using pulsed splitless technique coupled with gas chromatography by using electron capture detector. In this study, a quick, easy and cheap sample preparation method (QuEChERS) based on liquid extraction with acetonitrile, followed by dispersive solid phase extraction using primary secondary amine was tested for the separation and quantification of CP and CPO in wine samples. The accuracy of the developed method was tested upon recovery studies and it was calculated as (92.3 ±18.2) % for CP and (96.6 ±16.1) % for CPO. LOD and LOQ values of CP were found as 0.04 and 0.15 ng/mL and 0.49 and 1.62 ng/mL for CPO respectively.

KEYWORDS: chlorpyrifos, chlorpyrifos oxon, metabolite, pulsed splitless, pesticide, gas chromatography

REFERENCES:


