

The original method for identification of abamectin and ivermectin in pharmaceutical formulations used in producing animals, using liquid chromatography coupled to ultra efficiency photodiodes: Risk assessment of pesticide residues in dairy products

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Introduction

Avermectins are groups of macrocyclic lactones, classified as macrolides of lipophilic nature, which in mammalian organisms are metabolized, primarily, in the tissues of the liver¹. The Figure 1 shows the chemical structure of compounds, the abamectin is a mixture of avermectins, containing more than 80% avermectin B1a and less than 20% B1b. These two components, B1a and B1b have biological and toxicological properties very similar^{2,3}. The Association of Abamectin and ivermectin is an endectocide used to combat gastrointestinal and pulmonary nematode in cattle, is marketed in the form of an injectable solution. The use of this formulation is prohibited in lactating females where the milk is intended for human consumption⁴. However, these drugs are potent antiparasitic agents widely used in food-producing animals. Livestock farms implement manure treatment systems to increase productivity, reduce mortality, promote animal health and increase competitiveness on the market.

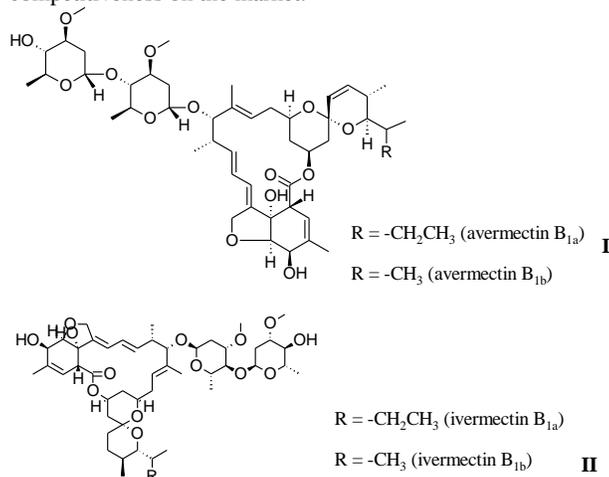


Figure 1. Structure of Compounds studied abamectin (I) ivermectin (II)

The extensive use in inappropriate conditions of substance there are risks of change food security, in order to generate residues in food products, spreading into the environment and causing toxic effects, such as allergic reactions and anaphylactic shock, in consumers⁵. The quality assessment of these drugs proves the need to verify the safety of food and the level of environmental contamination. The Ministry of agriculture, livestock and food supply of Brazil (MAPA) implements the national plan for the Control of Residues in products of animal origin (PNCRC), because the country is the holder of an extensive cattle breeding, and one of the most important trading partners, requires this control, particularly these days, where this practice is almost an imposition in the context of

international trade in food products⁶. The contaminant chemicals of which foods are exposed require control to ensure that they do not exceed the concentration value known as security limit or maximum residue level (MRL), that food can contain without prejudice to the organic integrity of humans, animals and the environment.

Experimental

According to the method has been designed and adapted for chromatography system UPLC-DAD. Working solutions abamectin and ivermectin were prepared in a concentration of 22.5 mgmL⁻¹ and 11.2 mgmL⁻¹, then was prepared in addition of a standard external range of 100 µgmL⁻¹, respectively. These solutions were ultra - sonically and filtered with (13 mm x 0.45 µm) nylon filter membrane, before Chromatographic separation that are performed in reverse-phase column C8 (4.6 mm x 25 cm x 5 µm) in mobile phase of water: acetonitrile 80:20 v/v and column flow rate of 0.1 mlmin⁻¹. The wavelength was selected according to the maximum absorbance of abamectin and ivermectin in 190, 220 and 280 nm.

Results and Discussion

In this way, the method developed is based on the identification of abamectin and ivermectin in the presence of gentamicin sulfate (substances) using liquid chromatography coupled to an ultra efficiency photodiodes arrangement (UPLC-DAD), the chromatographic conditions are adapted to the compounds cited. Figure 2 shows the results obtained the chromatography system. The methods of analysis were based in Boisseau 1996⁷ they showed satisfactory results in a detection limit (LD) and quantification (LQ) with linearity of R², it is possible to quantify the avermectines below the maximum residue limit (MRL).

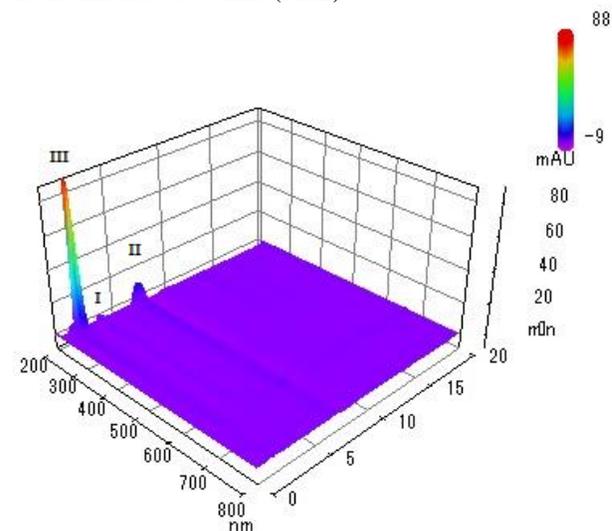


Figure 2. Chromatograms of (I) abamectin 100 µgmL⁻¹, (II) ivermectin 50 µgmL⁻¹ and (III) gentamicin 100 µgmL⁻¹

Basically, the results of the simultaneous identification of compounds different classes in a single analysis with running time of 20 min, being that the sample was fortified with gentamicin sulfate interference using as to verify the effectiveness of the method.

Conclusions

The methodology developed using UPLC-DAD is useful to quickly identify a mixture of macrolides and is considered the first step to quality control of veterinary drugs, which aims to promote safety and guarantee the minimization of waste generated in

foodstuffs of animal origin, recommended by the PNCRC/MAPA. Therefore, this method be used as a standard inspection method to meet the requirement of the MRL set by the regulation authorities and can be extended to other macrolide antibiotics.

Acknowledgement

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