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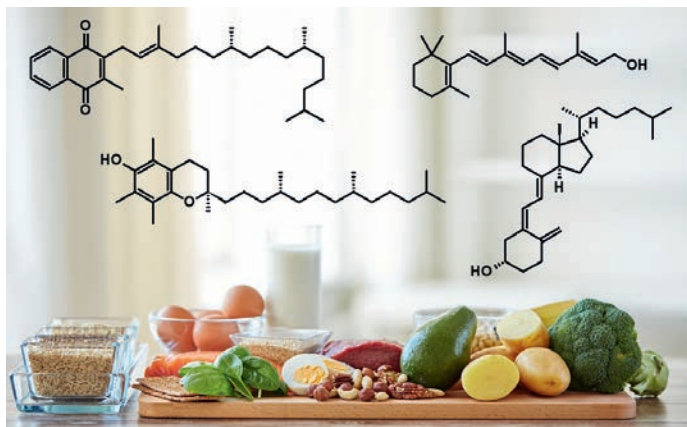
Fat-soluble Vitamins in Foods: Analysis by Supercritical Fluid Chromatography Coupled to Mass Spectrometry

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Keywords: Fat-soluble vitamins · Supercritical fluid chromatography · Vitamin A · Vitamin D · Vitamin E · Vitamin K

Fat-soluble vitamins are essential to maintain metabolic functions in humans and other species. Vitamin A is vital to maintain normal vision and healthy skin. Vitamin E's primary action in the human body is the protection of the cellular membranes from oxidation. Vitamin D is required to maintain healthy bones and muscles. Vitamin K plays an important role in blood coagulation.



Fat-soluble vitamins are essential to maintain health. Vitamin A (retinol) is found in eggs, milk and meat. Vitamin E (α -tocopherol) is naturally present in oils and nuts. Vitamin K (phylloquinone) can be found in leafy greens and oils, while vitamin D (calciferol) in the diet originates mainly from eggs and milk.

Fat-soluble vitamins, due to their physicochemical properties, are frequently extracted from the food matrix using large volumes of organic solvents. The different compounds are then analyzed using liquid chromatography, most of the times in normal-phase mode using organic solvents as the main mobile phase.

Supercritical Fluid Chromatography (SFC) uses a fluid in supercritical condition as mobile phase. Different fluids have been historically used, which presented several health, safety, and environmental concerns. In the past decades, SFC has evolved into modern SFC, based on the use of CO_2 , with enhanced safety and environmental advantages. CO_2 is safe and nontoxic. Additionally, when compared to liquid chromatography, SFC separations are faster and provide sharper peaks and improved resolution.

A new method for the analysis of fat-soluble vitamins using SFC-MS/MS was developed aiming to decrease the use of organic solvents. The extraction solvents used are aqueous papain solution, methanol, and isooctane. The extraction procedure allows the simultaneous isolation of vitamin A (as retinyl acetate, palmitate or retinol), vitamin E (as α -tocopherol or α -tocopheryl acetate), vitamin K (as phylloquinone or menaquinone-4) and vitamin D (cholecalciferol and ergocalciferol). The method is successfully applied in daily routine work.

The application of supercritical fluid chromatography coupled to mass spectrometry allows the simultaneous analysis of fat-soluble vitamins in foods. The method shows enhanced safety and reduced cost as compared with previous methodologies. Its application in control laboratories dramatically increases sample throughput and reduces solvent consumption.

Received: July 12, 2019

Reference

J. M. Oberson, E. Campos-Giménez, J. Rivière, F. Martin, *J. Chromatogr. B* **2018**, 1086, 118.

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