Application, challenges and future prospects of recent nondestructive techniques based on the electromagnetic spectrum in food quality and safety

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Source FOOD CHEMISTRY
Volume: 441
DOI: 10.1016/j.foodchem.2024.138402

Article Number 138402

Published MAY 30 2024

Early Access JAN 2024

Document Type Review

Abstract Safety and quality aspects of food products have always been critical issues for the food production and processing industries. Since conventional quality measurements are laborious, time-consuming, and expensive, it is vital to develop new, fast, non-invasive, cost-effective, and direct techniques to eliminate those challenges. Recently, non-destructive techniques have been

applied in the food sector to improve the quality and safety of foodstuffs. The aim of this review is an effort to list non-destructive techniques (X-ray, computer tomography, ultraviolet-visible spectroscopy, hyperspectral imaging, infrared, Raman, terahertz, nuclear magnetic resonance, magnetic resonance imaging, and ultrasound imaging) based on the electromagnetic spectrum and discuss their principle and application in the food sector. This review provides an in-depth assessment of the different nondestructive techniques used for the quality and safety analysis of foodstuffs. We also discussed comprehensively about advantages, disadvantages, challenges, and opportunities for the application of each technique and recommended some solutions and developments for future trends.

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