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Innovative nondestructive imaging techniques for ripening and maturity of fruits – A review of recent applications

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Abstract

Background: For decades, fruit assessment without off-line interruption and sample destruction was a challenge for producers, researchers and food safety agencies. Efforts have therefore been exerted towards the introduction and advancements of innovative imaging technologies for fast, non-invasive and non-destructive monitoring of ripening and maturity stages of fresh produce.

Scope and Approach: Owing to their non-destructive nature, environmental friendliness, reliability accuracy and simplicity of imaging techniques have been successfully exploited for rapid evaluation of ripening and maturity stages of fruits. The current review provides an overview of recent applications in the last few years. The imaging techniques presented include spectral techniques (Raman imaging, hyperspectral imaging, fluorescence imaging and laser light backscattering imaging), nuclear magnetic techniques (magnetic resonance imaging and soft x-ray) and other techniques including thermal imaging, infrared thermography and microwave imaging. The principles of these imaging techniques are also briefly highlighted, and their applicability is summarized.

Key Findings and Conclusions: The contemporary imaging techniques presented in this review portray continuous productiveness as excellent quality assessment, particularly for ripening and maturity analysis tools for fruits. Thus, these novel techniques hold great potentiality to replace conventional procedures, because such traditional approaches lack ability to examine fruit ripening and maturity indicators such as lycopene content, flesh freshness, soluble solid content, and other internal quality parameter rapidly and efficiently, furthermore such techniques are time consuming, laborious, destructive and tedious.

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