Title Near-infrared spectroscopy and imaging in food quality and safety

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Abstract

Over the last two decades, near-infrared spectroscopy (NIRS) has established itself as a non-destructive analytical technique in a variety of disciplines. However, recent technological advancements in hardware design and data mining techniques have unleashed the potential of NIRS to become a tool of choice for routine analyses of agricultural products. The current paper synthesizes the status of NIRS in the agri-food industry in terms of hardware and software development as well as the direction in which the NIRS research is headed. An extensive review of literature reveals that the emphasis on hardware development is focused on developing compact, robust, and portable spectrometers and hyperspectral imaging (HSI) systems. The software development on the other hand is geared towards developing better preprocessing, analyses, and modeling techniques using chemometrics, support vector machines, and artificial neural networks. The four main agri-food sectors identified to be the beneficiaries of this research revolution are grain quality monitoring; post-harvest handling of fruits and vegetables; identification of contaminants in animal produce and feed; and food safety and authenticity. Apart from discussing the aforementioned topics, the paper also provides food scientists some working knowledge on parameters crucial to the performance of spectral and imaging systems. It is expected that further development of NIRS will help agricultural and food scientists to enhance the quality and safety of our food.