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Application of hyperspectral imaging for rapid screening of key quality parameters in cereal grains

Nicola Caporaso
University of Nottingham, UK

Hyperspectral imaging (HSI) applies both near-infrared spectroscopy (NIR) and imaging to produce a hypercube, this is useful to explore the internal structure and the chemical spatial distribution across a material. The applications of HSI in food science have spread widely during the past few years due to its enormous advantages for on-line quality control, i.e., reduced analysis time and non-destructive nature. The aim of this work was to explore the potential of HSI on characterizing whole wheat kernels. HSI was used to classify the grains according to germination and oxidation state in four wheat cultivars, two soft wheat varieties (UK) and two Durum varieties (Italy). For the first experiment, samples were soaked in distilled water and left to germinate at ambient temperature (7 points over 48 hours). For the second experiment, samples were stored in accelerated oxidizing conditions at ca. 70°C within an oven and 7 points were taken over 56 hours. HSI spectra were recorded in the NIR range (1000-2500 nm) with an interval of 2 nm using an HgCdTe detector and image resolution of 320×256 pixels. Hyperspectral images were processed by subtracting the white and black references and the reflectance calculated. The second derivative using the Savitzky-Golay formula was useful to define the most significant changes in the spectra, i.e., identifying the absorption peaks. Principal component analysis was used to discriminate the samples according to germination and oxidation times as well as to explore the main sources of variance in the hypercube within single grains. In conclusion, the results successfully illustrated the potential of HSI on whole wheat kernels and further developments in this field are expected.

Biography

Nicola Caporaso is a PhD student at the University of Nottingham (UK) within the Food Science Department, School of Biosciences. He is based at Campden BRI, a leading member-based research centre in the field of food and beverage. His PhD project deals on the application of hyperspectral imaging for chemometric sorting of food ingredients. He has a BSc and MSc in Agricultural Science and Technology from the University of Naples Federico II (Italy) and got expertise in olive oil chemistry, sensory analysis and aroma compounds. He is co-author of 13 papers published on peer-reviewed journals and 8 posters presented at scientific congresses.

Nicola.Caporaso@campdenbri.co.uk

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