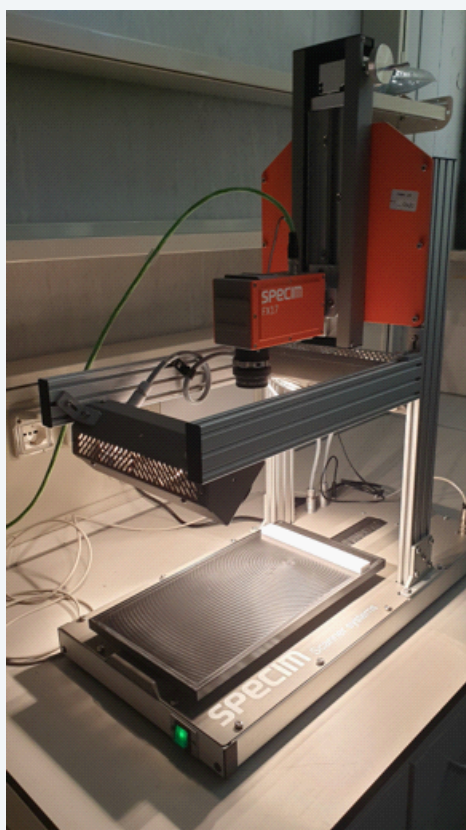


THEMATIC NETWORK

CREA Research and Innovation Platforms and Infrastructures

NAME OF THE PLATFORM / INFRASTRUCTURE

Hyperspectral Imaging Platform for Phenotyping and Food Quality Assessment



BRIEF DESCRIPTION OF THE INFRASTRUCTURE

The Short-Wave Infrared (SWIR) hyperspectral imaging platform is designed for the rapid, non-destructive phenotyping and quality characterization of food products and agri-food matrices. The platform is based on the SisuCHEM Hyperspectral Chemical Imaging Analyser (SPECIM, Spectral Imaging Ltd., Oulu, Finland), which operates over the spectral range of 935–1720 nm.

The technology combines spectral and spatial information, providing a spectral signature for each image pixel that can be related to the biochemical properties of the sample. In the SWIR region, the interaction of radiation with O–H, C–H and N–H bonds provides information on the presence and distribution of water, proteins, lipids, cellulose, sugars and other organic compounds. Unlike conventional spectroscopic techniques, hyperspectral imaging enables both the characterization of sample composition and the visualization of its heterogeneity and spatial distribution. The integration of chemometric methods and artificial intelligence techniques allows the large amount of information contained in hyperspectral images to be processed and translated into models for sample classification and the prediction of quality parameters.

In phenotyping applications, the platform can be used to investigate parameters and traits such as water content, biochemical composition, ripening stage, stress conditions, varietal differences, internal damage and fungal contamination in leaves, seeds, roots, fruits and other plant tissues.

In the agri-food sector, its main applications include the assessment of ripening and chemical composition, the non-destructive prediction of quality parameters, shelf-life evaluation, the detection of defects and contamination, the identification of foreign bodies, and the detection of food fraud.

Overall, the platform supports the development of rapid, reproducible and non-destructive analytical methods applicable to a wide range of matrices, with potential applications in research and quality control, as well as in the transfer of innovative technologies to the agri-food sector.

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