SPECTRAL SIGNATURES: A WAY TO IDENTIFY SPECIES AND CONDITIONS OF VEGETABLES

Oral paper

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When the optical radiation reaches the surface of any of the numerous components of the environment is subject to one or more of the following processes: it can be reflected, transmitted or absorbed, according to energy conservation laws. The characteristics and intensity of this behaviour depend on the material and surface quality the radiation impinging on. The particular combination of elements making up the material staff, their proportions, quantity, size and form will determine the characteristics of the interaction, setting which aspects of the incident radiation will be modify and in what extent. Among the characteristics of the interaction determined by the matter structure, we are particularly concerned in reflection and absorption. Those, expressed by means of spectral reflectance or absorbance functions of materials, especially of vegetables and named here as “spectral signatures”, allows us to obtain information about constitution and condition of the material analysed: measuring the spectral signature with enough precision will allow, under specific conditions and by means of an adequate treatment of data, identifying not only the specie to which the signature corresponds to, but also its phenology and nutritional condition as well as the presence or absence of diseases, affections and scarcities of the plant from which the sample comes from.

This work shows the results obtained by the application of suitable techniques for the acquisition and processing of spectral absorbance data of several vegetable species, allowing its identification –assignment of each spectral signature to one specific plant– which in turn allows the control of origin of products (foodstuffs or not) and their characteristics. Spectral measurements of absorbance were performed on samples of two sugarcane varieties and four citrus types (orange, lemon, tangerine and grapefruit) taken periodically from a controlled crop, using a spectrophotometer FOSS-NIR 6500 in the range of 400-2500 nm by 2 nm. The measured samples were about 180 in the case of sugarcane and 160 in the case of citrus. A Principal Component Analysis was applied to the data by means of STATA 9 software and the results were interpreted in that PCA context. This procedure allowed us not only to clearly identify which variety of sugarcane corresponds to each spectral absorbance function, but also to determine which wavelength or wavebands have significative relevance for that identification. Similarly, this technique allows us to identify and classify the spectral functions coming from different types of citrus. The main conclusion is that the proposed technique is capable to precisely identifying the species each sample comes from; besides, this

technique would allow us to determine the nutritional or health condition of them at the moment of the analysis, as could be seen from the obtained results.

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