

## O2 AS1

### AN APPLICATION OF PARAFAC ON EXCITATION–EMISSION MATRIX FLUORESCENCE SPECTRA FOR GREEN TEA CHARACTERISATION

E. Mustorgi<sup>1</sup>, M. Casale<sup>1</sup>, M. Hooshyari<sup>1</sup>, P. Oliveri<sup>1</sup>, C. Malegori<sup>1</sup>, R. Bro<sup>2</sup>, S. Furlanetto<sup>3</sup>

<sup>1</sup>Department of Pharmacy, University of Genoa, Italy

<sup>2</sup>Department of Food Science, Faculty of Life Sciences University of Copenhagen København Denmark

<sup>3</sup>Department of Chemistry University of Florence, Florence, Italy

The main objective of the present work was to evaluate the potential use of excitation–emission matrix (EEM) fluorescence spectroscopy, combined with a multi-way decomposition method such as Parallel Factor Analysis (PARAFAC) [1], for the characterization of green tea (GT) samples.

The claimed beneficial effects of GT are ascribed to catechins and methylxanthines, used as not only as chemical descriptors but as indicators of the geographical origin of tea.

The three-dimensional spectra of 50 GT samples (22 Japanese and 28 Chinese) were recorded using a Perkin–Elmer LS55 (Perkin-Elmer Ltd., Beaconsfield, UK) fluorescence spectrometer, a standard cell holder and a 10 mm quartz SUPRASIL® cell; excitation spectra were recorded between 200 and 290 nm, whereas the emission wavelengths ranged from 295 to 800 nm. The use of PARAFAC allowed to decompose the three-way arrays in EEM data into trilinear components and to detect the main fluorophores in GT samples; in particular, in the second mode of PARAFAC, four signals were highlighted that can be interpreted as the emission spectra of four tentative fluorophores.

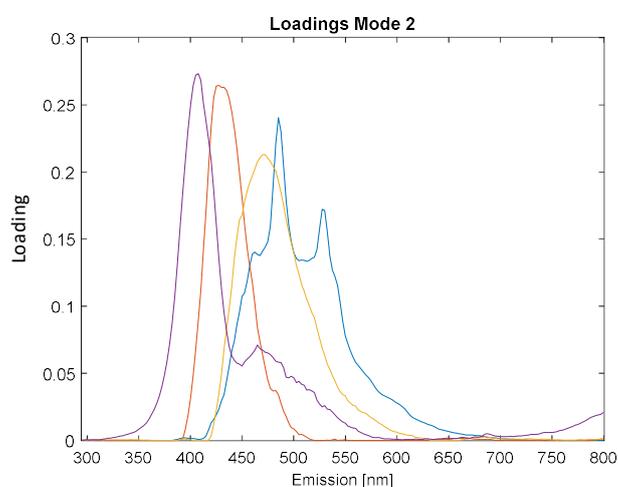


Figure 1. PARAFAC results: the profiles show the loadings on the second mode (emission profiles)

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The emission bands at 400-450 nm are due to fluorophores particularly present in Chinese green teas and that the broad band at 500-550 nm is related to the presence of chemical compounds more abundant in Japanese green teas.

The two bands (in violet and red) at 400-450 nm and the band with maximum around 470 nm (in yellow) correspond to the fluorescence emission of catechins and methylxanthines respectively, which are more abundant in Chinese samples and the broad band around 500-550nm is attributable to carotenoids which are recognized in particularly high quantities in Japanese tea. A cyclodextrin-modified micellar electrokinetic chromatography method was employed to quantify the most represented catechins and methylxanthines in GT samples and the outcomes were in agreement with the fluorescence spectroscopy observations.

This study shows that EEM fluorescence spectroscopy combined with chemometrics offers a promising approach for the discrimination of green tea samples based on their geographical origins.

### **References**

- [1] Bro R., PARAFAC. Tutorial and applications, Chemom. Intell. Lab. Syst. 1997, 38, 149-171.