



Università di Foggia

# 4<sup>th</sup> MS-food Day



October, 07–09, 2015  
Foggia - Italy

## BOOK OF ABSTRACTS



## **P2 - STABLE ISOTOPE AND MULTIELEMENT COMPOSITION OF COCOA SEEDS FROM DIFFERENT GEOGRAPHIC ORIGIN**

*Matteo Perini, Daniela Bertoldi, Alice Barbero,  
Luana Bontempo, Roberto Larcher, Federica Camin*

Fondazione Edmund Mach, Via E. Mach, 1, 38010 San Michele all'Adige (TN), Italy

Cocoa is a high-value commodity that appeals to the consumer's taste, but it is also renowned for its antioxidant and healthy properties. Many of these characteristics as well as flavour and its economic value depend on the geographic origin. For this reason, an effective method to identify the geographic origin of cocoa beans is desirable both for consumer, producers, retailers and administrative authorities in order to disclose commercial fraud.

In this work we aim to couple the mineral profile (ICP-MS analysis) and the stable isotope ratios (IRMS analysis) of 61 cocoa beans produced in 23 countries of East and West Africa, Asia and Central and South America endeavouring to find a tool for the determination of their geographical origin.

The ratios of  $^{13}\text{C}/^{12}\text{C}$ ,  $^{15}\text{N}/^{14}\text{N}$ ,  $^{18}\text{O}/^{16}\text{O}$ ,  $^2\text{H}/^1\text{H}$ ,  $^{34}\text{S}/^{32}\text{S}$  and the content of 56 macro-, micro- and trace-elements (Li, Be, B, Na, Mg, Al, P, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Rb, Sr, Y, Mo, Pd, Ag, Cd, In, Sn, Sb, Te, Cs, Ba, La, Ce, Pr, Nd, Sm, Eu, Gd, Dy, Er, Tm, Yb, Re, Ir, Pt, Au, Hg, Tl, Pb, Bi, Th and U), measured by Isotope Ratio Mass Spectrometry and ICP-MS, are used to develop a chemometric approach of geographic traceability. The model provided an optimal discrimination among the 5 subcontinental origins, achieving 100% of correct re-classification. The model was cross-validated (leave-one-out procedure) with satisfactory results (>85% correct reclassification).

The use of these parameters will allow the development of analytical control procedures that can be used to check the geographical provenance of cocoa beans.