

## L-7

### USE OF PROTEIN- AND METABOLITE PROFILING TECHNIQUES ON WHEAT GRAIN IN SEARCH OF BIOMARKERS DISTINGUISHING SAMPLES GROWN UNDER DIFFERENT AGRICULTURAL SYSTEMS

Anja Bonte<sup>1</sup>, Heiko Neuweiger<sup>2</sup>, Isabell Hildermann<sup>3</sup>, Paul Mäder<sup>4</sup>, Karsten Niehaus<sup>5</sup>, Georg Langenkämper<sup>6</sup>\*

<sup>1 6</sup> Max Rubner-Institut, Detmold, Germany

<sup>2</sup> Bielefeld University, present address: Bruker Daltonics, Bremen, Germany

<sup>3 4</sup> FiBL, Frick, Switzerland

<sup>5</sup> Bielefeld University, Bielefeld, Germany

\*Corresponding author – E-mail:

georg.langenkemper@mri.bund.de, Phone: +49 (0)5231 741-441

The increasing popularity of organic farming and organic food leads to a great economic interest in finding discriminating analytical methods to ensure the authenticity of organic labeled products. Using the profiling approach aims firstly, to detect a large number of known and unknown metabolites and proteins and secondly, to identify differences in occurrence or concentration of these biomolecules in wheat of the different agricultural systems. Samples of 11 different wheat grain varieties were taken from the controlled DOK-field trial of the Research Institute of Organic Agriculture (FiBL) and the research station Agroscope Reckenholz-Tänikon (ART), Switzerland. Each variety was cultivated with four plot replications at the same location under organic and conventional conditions, which ensures an equal environmental influence and therefore the comparability of research results. We analysed 11 different wheat varieties of the harvest year 2007 to assess the influence of a diverse genetic pool on the spread of analytical results. Additionally, samples of the wheat variety "Runal" were taken over three harvest years in order to account for influence of seasonal variations. Protein profiling was performed with 2D-gelelectrophoresis and 2D-image analysis was done using Delta2D-software. Proteins were identified via MALDI-TOF-MS/MS and database searches. Metabolite profiles were generated with GC-MS from derivatised methanolic extracts of finely ground whole wheat grains. Employing these techniques on the variety "Runal", we were able to identify 48 metabolites and additionally to detect 245 not identified metabolites (TAGs). In this pool of biomolecules, two metabolites showed significant differences in normalised peak areas in all three harvest years of "Runal". Across all 11 varieties of the 2007 harvest year, 5 metabolites and 11 TAGs with significant differences in peak areas between the cultivation forms were detected, using Student t-tests. PCA performed on data for the individual varieties revealed a clustering according to the cultivation forms. However, PCA of metabolites and TAGs of combined data of all 11 varieties did not result in a clustering. Protein identification is currently in progress. For "Runal" we were able to detect 2 proteins with significant different levels in samples of conventional and organic cultivation forms until now. Based on individual varieties, metabolite profiling has shown promising results with respect to discriminate organic and conventional wheat. Results viewed across all 11 varieties indicated a higher influence of the variety and seasonal effects than the cultivation form on metabolite concentration. Further work will prove, if significant differences of concentrations in individual metabolites and TAGs as well as proteins can be used to discriminate between cultivations forms across multiple wheat varieties.

*Keywords: wheat, food omics, organic farming, authenticity*

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## L-8

### MULTIDIMENSIONAL GC (MDGC) AND CARBON ISOTOPE RATIO MS (GC-C-IRMS) FOR THE AUTHENTICITY ASSESSMENT OF CITRUS ESSENTIAL OILS

Ivana Bonaccorsi<sup>1\*</sup>, Danilo Sciarrone<sup>2</sup>, Peter Tranchida<sup>3</sup>, Luisa Schipilliti<sup>4</sup>, Paola Dugo<sup>5</sup>, Luigi Mondello<sup>6</sup>

<sup>1 2 3 4 5 6</sup> Dipartimento Farmaco-chimico, Facoltà di Farmacia, Università di Messina, Messina, Italy

\*Corresponding author – E-mail: ivabonaccorsi@unime.it, Phone: +39-0906766572

Enantiomeric ratios of chiral volatile components represent a useful parameter for the assessment of authenticity of essential oils. However, often the seasonal variations which occur during ripening of the fruits are quite wide, not yet well determined, thus rendering this tool not completely reliable by itself. Assessment of genuineness is thus often carried out by multiple analytical techniques (physico-chemical analyses, GC, es-GC, HPLC) in order to evaluate sufficient parameters to express a secure judgment. More over if distilled oils are analyzed the enantiomeric ratios are subject to variations due to the possible reactions with consequent tendency to racemization of some chiral volatiles. The carbon isotope ratio, on the other hand, is strictly dependent on the plant biochemistry, and on the geographical origin. It is not subject to seasonal variation, nor to the extraction procedure used. However at this time sufficient data on authenticity ranges for all Citrus oils is not yet available. This study has been carried out on numerous samples of different Citrus essential oils by Es-MDGC, Es-GC and GC-C-IRMS, to determine if the combination of enantiomeric ratios with the carbon isotope ratios can be effective to determine the genuineness of the samples studied.

*Keywords: enantiomeric ratios, isotopic ratio, citrus essential oils*