Drying, Juices and Jams of Organic Fruit and Vegetables: what happens to Desired and Non-Desired compounds?

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Roberto Lo Scalzo, Coordinator

- Research Group:
- Valentina Picchi, Marta Fibiani, Giulia Bianchi (Researchers),
- Fabio Lovati, Raffaele Lapignola (Technicians)
Hystory and Coordination activities

The Project Idea started thanks to the collaboration with the Colleagues of CRA-ORA, Dr. Gabriele Campanelli (expert in organic agriculture) who introduced the link with Denmark (Prof. Ulla Kidmose) and Dr. Emidio Sabatini (expert in genetics), with his previous co-working with Prof. Wilfried Schwab (Germany);

The collaboration with Dr. Eivind Vangdal (Norway) started some years ago with our colleague Dr. Anna Rizzolo in the framework of post-harvest studies;

The participation of Prof. Ulvi Moor (Estonia) was due to a collaboration with Estonia University of Life Sciences for an Erasmus PhD Student (Prof. Vokk) within the CRA-IAA MIERI Project regarding small processing plants for organic and small-scale agriculture production;

The collaboration with Prof. Giovanna Speranza, UNIMI, Department of Organic Chemistry, started with several graduate thesis on interesting topics regarding the role of natural organic compounds in the quality of food products;

The Coordination of CRA-IAA started in this very interdisciplinary context;

Hence, an acknowledge is due to the CRA-IAA Director and all staff for the help and support.
CORE Organic is the acronym for "Coordination of European Transnational Research in Organic Food and Farming Systems". As an ERA-NET action, it intends to increase cooperation between national research activities by National Funding Bodies (for Italy, represented by Italian Ministry of Agriculture).
Coordinator
Roberto Lo Scalzo, Consiglio per la Ricerca in Agricoltura e l’Analisi dell’Economia Agraria, Research Unit of Food Technology

Partners
- Ulvi Moor, EMU Estonian University of Life Sciences, Estonia.

- Eivind Vangdal, BIOFORSK Bioforsk, Norway.

- Ulla Kidmose, AU-FOOD Aarhus University, Department of Food Science, Denmark.

- Wilfried Schwab, TUM Technische Universität München, Germany.

- Gabriele Campanelli, CREA-ORA Consiglio per la ricerca in agricoltura e l’analisi dell’economia agraria, Italy.

- Giovanna Speranza, UNIMI University of Milan, Department of Chemistry, Italy.
Main Objective:

The questions that the proposal attempt to resolve regard the presence of positive compounds (antioxidants and tastants, *desired*) and negative ones (mycotoxins and allergens, *undesired*) in the organic products that are subjected to processing in chains that are small and, consequently, adapted for local productions.
Project: persons
Project overview:

- Organic and conventional agricultural products, from diffused fruit and vegetables (apples, plums, tomatoes, sweet pepper);
- Processed products (juices, jams and drying);
- Advanced sensory studies;
- Desired compounds (antioxidants and positive tastants);
- Undesired compounds (allergens and mycotoxins).
Project: roles

Estonia

Quality indexes (desired) and patulin risk (undesired) in organic apple juice

Norway

Organic apple and plums cultivation, quality indexes in different varieties (desired)
Denmark

Advanced sensory studies and metabolomic analyses on small molecules important for the taste (desired)

Germany

Allergens analyses on conventional and organic raw and processed products

Studies on new “Umami” and “Kokumi” tastants in processed products from organic vegetables.
Crea-IAA activities

Processing by drying with a conventional system and an innovative solar dryer system manufactured by Termotend, Carpi (Modena, Italy)
(Fan forced) air outlet,
Flow 0.3 m³/s

T* represents the location of temperature probes
Tomato drying
Measurement of antiradical capacity
(Dr. Marta Fibiani)

Evaluation of the effect of vegetal matter on some in-vitro generated free radical

A very useful technique to evaluate the presence of free radicals is

**EPR**

*(Electron Paramagnetic Resonance)*

based on paramagnetic properties of free radicals

\[ h\nu = g\beta H \]

The EPR spectroscopy is a DIRECT method to evaluate the antiradical activity of fruit and vegetables
Superoxide anion
6,4 mM, 1', 25°C

\[ \text{DMPO} + \text{O}_2^- \rightarrow \text{DMPO-OOH}^- \]

No scavenger

Gallic acid 0,3 mM
Hydroxyl Radical
2 mM, 1', 25°C

DMPO

DMPO-OH'

No scavenger

Gallic acid 0.6 mM
Measurement of the redox-status
(Dr. Valentina Picchi)

Determination of antioxidant metabolites
(Ascorbic acid and Glutathione)

by means of an
HPLC method with amperometric detection

The reaction with DTT (dithiothreitol) allows to evaluate
the content of both the reduced and oxidized forms of
Ascorbic and Glutathione

Important for the evaluation of the redox status and
antioxidant capacity of the biological material under study
Example of HPLC-ECD chromatograms on apple peels extracts

- **extract**
- **extract + DTT**
Fast Blue BB assay for phenolics

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Original research article

Comparative analysis of strawberry total phenolics via Fast Blue BB vs. Folin–Ciocalteu: Assay interference by ascorbic acid

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c Residue Chemistry and Predictive Microbiology Research Unit, Eastern Regional Research Center, Agricultural Research Service, U.S. Department of Agriculture, Wyndmoor, PA 19038, United States
Possible new tastants

Volatile compounds
(Dr. Giulia Bianchi)

Dried sweet red peppers
In some dried peppers we have found by SPME-GC-MS the *tetramethylpyrazine*, well noted as flavouring agent with a pleasant nutty taste and as bioactive compound with functional properties. It seems to be produced by not-well known fermentation phenomena coupled with Maillard reaction due to drying processing.
Thanks for your participation