NOVEL APPROACHES AND TECHNOLOGIES FOR CURRENT AND FUTURE CHALLENGES IN AGRICULTURAL CHEMISTRY

14 – 17 February 2022 – Udine, Italy

Monday, 14 February 2022

09:00 – 09:10	**Opening Session**

Session 1: Introduction to agroecosystem

Moderators: Gianpiero VIGANI

09:10 – 09:50	**Innovative analytical approaches in soil science: What benefits from x-ray analyses?** *Concetta Eliana GATTULLO, University of Bari, Italy*
09:50 – 10:30	**Introduction to metabolomics and it's potential uses in plant ecophysiology** *Fabrizio ARANITI, University of Milan, Italy*
	Coffee break
10:45 – 11:45	**Structure, function and host control of the crop microbiota** *Davide BULGARELLI, University of Dundee, Scotland, UK*

Workshop: Presenting your research

Moderator: Fabrizio ARANITI

11:45 – 12:00	**Tomato plant responses induced by sparingly available inorganic and organic phosphorus forms are modulated by strigolactones** *Veronica SANTORO, University of Turin, Italy*
12:00 – 12:15	**A collagen-derived protein hydrolysate as plant biostimulant: the importance of elucidating the roles of bioactive peptides** *Stefano AMBROSINI, University of Verona, Italy*
12:15 – 12:30	**Root exudates reuptake and alteration of carbon isotope fractionation by tomato plants under phosphorus deficiency** *Fabio TREVISAN, Free University of Bozen, Italy*
12:30 – 12:45	**Miscible displacement of potassium in the rhizosphere** *Aline BATISTA, University of São Paulo, Brazil*

Tuesday, 15 February 2022

Session 2: Plant session

Moderators: Anita ZAMBONI, Laura ZANIN

09:00 – 10:00	**Machine learning to get insights into nitrogen signaling interactions in plants** *Gabriel KROUK, SupAgro Montpellier, France*
10:00 – 10:40	**Effect of microbial communities on gene expression in plants** *Fabio MARRONI, University of Udine, Italy*
	Coffee break
11:00 – 11:40	**The potential of MS-based untargeted metabolomics in plant science** *Maria Begona MIRAS MORENO, University of Piacenza, Italy*
11:40 – 12:20	**Photomodulation in plant biology: applications, perspectives and opportunities** *Marco LANDI, University of Pisa, Italy*
12:20 – 12:30	**Sponsor Time**

Wednesday, 16 February 2022

Session 3: Soil session

Moderators: Daniela PEZZOLLA, Daniel SAID PULLICINO

09:00 – 10:00	**Plant- or microbial-derived? Sources of soil organic matter and their relevance to carbon dynamics** *Gerrit ANGST, Biology Centre CAS, Czech Republic*
10:00 – 10:40	**Developing novel Lunar and Martian regolith-based substrates for pedogenesis and space farming studies** *Antonio CAPORALE, University of Naples, Italy*
	Coffee break
11:00 – 11:40	**Microsensor technology to quantify acclimation traits in rice roots against soil anoxia** *Elisa PELLEGRINI, University of Udine, Italy*
11:40 – 12:20	**X-ray Computed Tomography for Soil and Plant Sciences Applications** *Craig STURROCK, University of Nottingham, UK*
12:20 – 12:30	**Sponsor Time**

Thursday, 17 February 2022

Session 4: Microorganism session

Moderators: Youry PII, Nicola TOMASI

09:00 – 09:40	**Omics approaches to study soil functionality** *Laura GIAGNONI, University of Brescia, Italy*
09:40 – 10:20	**The hidden role of soil biodiversity in plant and animal health: Making the invisible visible** *Luigimaria BORRUSO, Free University of Bozen, Italy*

Coffee break

Workshop: Presenting your research

Moderator: Sara BUOSO, Antonio CAPORALE

10:40 – 11:40	**From data to stories: public science communication is a complex and fascinating challenge** *Elisabetta TOLA, Formicablu, Italy*
11:40 – 11:55	**Microclimate, soil chemistry and microbiota fail to explain Janzen-Connell distribution of *Euphorbia dendroides* in a Mediterranean shrubland** *Mohamed IDBELLA, University of Naples Federico II, Italy*
11:55 – 12:10	**Impact of tillage erosion state on ^{14}C labelled assimilate C distribution in a spring rapeseed (*Brassica napus* L.) soil system and soil C pools** *Ayten PEHLIVAN, Leibniz-Centre for Agricultural Landscape Research and Humboldt University of Berlin, Germany*
12:10 – 12:25	**Assessing phosphorus availability and uptake by paddy rice: soil testing and plant responses** *Sara MARTINENGO, University of Turin, Italy*
12:25 – 12:40	**An integrative approach to study the responses of *Zea mays* L. to organic nitrogen provided to roots in the form of amino acids** *Chiara MURATORE, University of Milan, Italy*
12:40 – 13:00	**Best Presentation Awards & Closing session**

An integrative approach to study the responses of *Zea mays* L. to organic nitrogen provided to roots in the form of amino acids.

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Although the capacity to take up organic nitrogen (N) in the form of amino acids is widespread among plants, their relevance for N nutrition in crops has been little investigated compared to inorganic N sources. In the last years, several studies have pointed out that distinct amino acids exert different effects on plant morphology and physiology. However, less is known about their effects on plant metabolism, especially when supplied to the roots at composition and concentration mimicking soil conditions. In this respect, this work aimed to investigate the capacities of crops, such as maize (*Zea mays* L.), to utilize amino acids as N nutrients through an approach that integrates morphological, physiological, biochemical and proteomic evaluations. Maize seedlings were grown by a hydroponic system for three days in the absence of N and then were provided for further four days with 250 µM of a mixture of eight amino acids [Glutamic acid (50 µM), Glutamine (50 µM), Glycine (50 µM), Alanine (50 µM), Aspartic acid (12.5 µM), Arginine (12.5 µM), Lysine (12.5 µM) and Threonine (12.5 µM)], or with 250 µM of inorganic N in the form of nitrate. Plants were analyzed after five and seven days of hydroponic growth to follow both early responses and later metabolic adjustments. Plants supplied with amino acids continued to grow over the experiment, although less than those supplied with nitrate. Therefore, plants utilized both the N sources for growth. In detail, amino-acid treated plants were characterized by a decreased root/shoot ratio and a shorter but thicker root system than nitrate-treated plants. The responses at a nutritional and metabolic level significantly differed, as suggested by changes in the plant content of nitrate, ammonium and key metabolites such as reducing sugars and sucrose. The LC-ESI-MS analysis of amino acid composition in roots, xylem sap and leaves revealed that the roots of plants supplied with amino acids showed an upsurge in the levels of uncharged and basic amino acids. Interestingly, glutamine and alanine were the major amino acids translocated through xylem sap for both the nutritional conditions, while the proportion of amino acids in leaves was more constant over time. Overall, these results highlight the different roles played by roots and leaves in response to N inputs and suggest that roots perceived and adapted promptly to the kind of N available and influenced N translocation to the shoot. In order to clarify the meaning of these metabolic adjustments, large-scale analysis of the total proteome fraction of roots and leaves based on one-dimensional Gel Liquid Chromatography-Mass Spectrometry (1D GeLC-MS/MS) is ongoing. This study will improve the knowledge about plant responses to different N inputs and plant metabolic use of amino acids, providing information that could be useful for enhancing the sustainability of crop production.