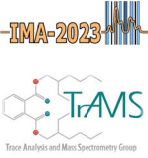




Longitudinal plant health monitoring via HRMS screening workflows



Anthi Panara, Evangelos Gikas, Anastasia Koupa and Nikolaos S. Thomaidis*

Laboratory of Analytical Chemistry, Department of Chemistry, National and Kapodistrian University of Athens, Panepistimioupolis Zografou, 15771 Athens, Greece
*e-mail: ntho@chem.uoa.gr

RESEARCH—CREATE—INNOVATE
IKOPROTECTA
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What is Composting?

Composting is the aerobic decomposition of organic materials into humus-like material through microbial action.

Why is composting beneficial?

- Increase in agricultural production
- Enhancement of plants' nutrient status
- Environmentally friendly product
- Contribution to cyclic economy

Introduction

Plant selection

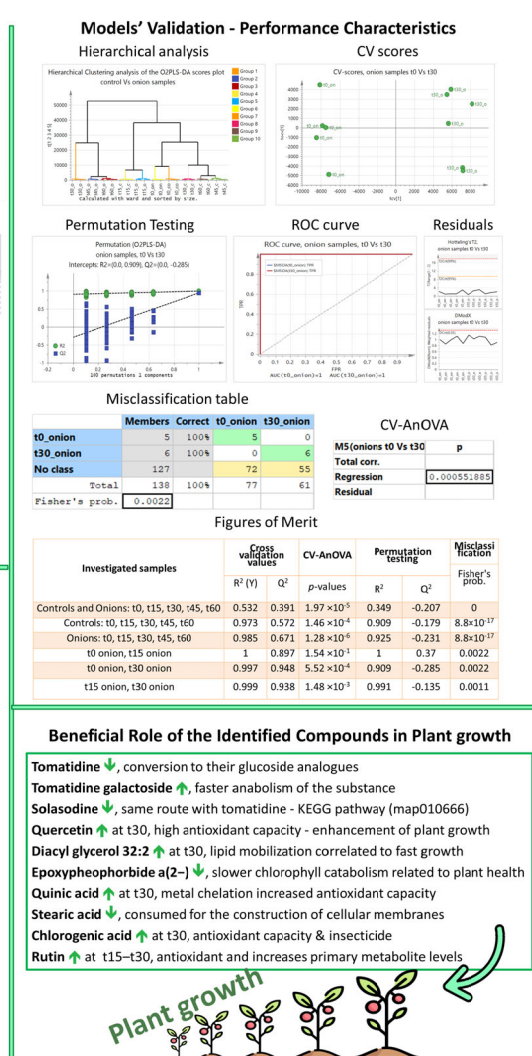
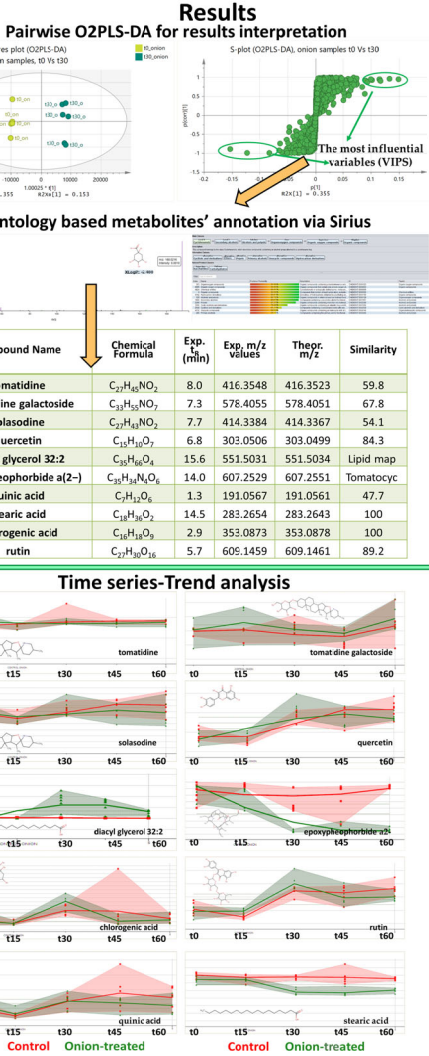
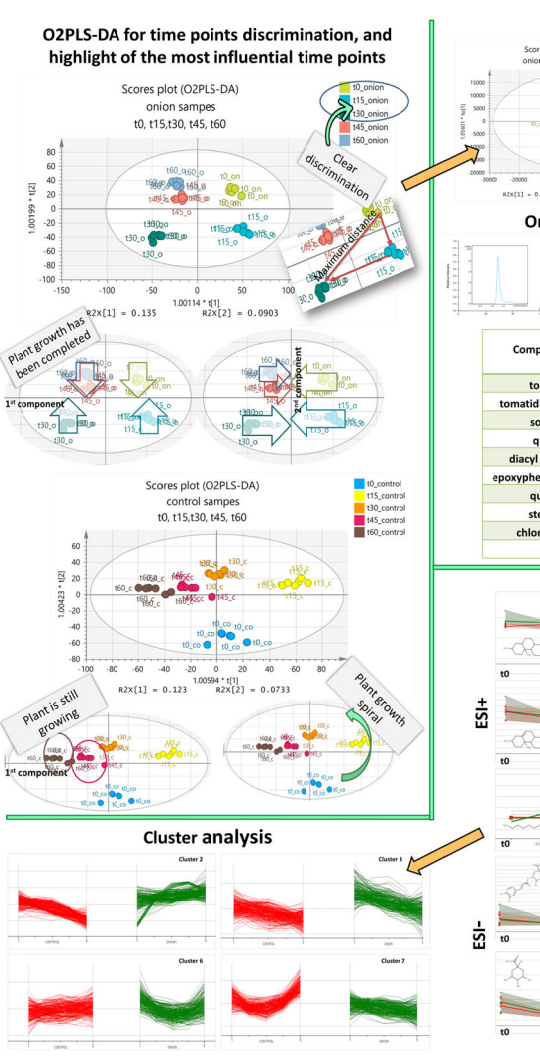
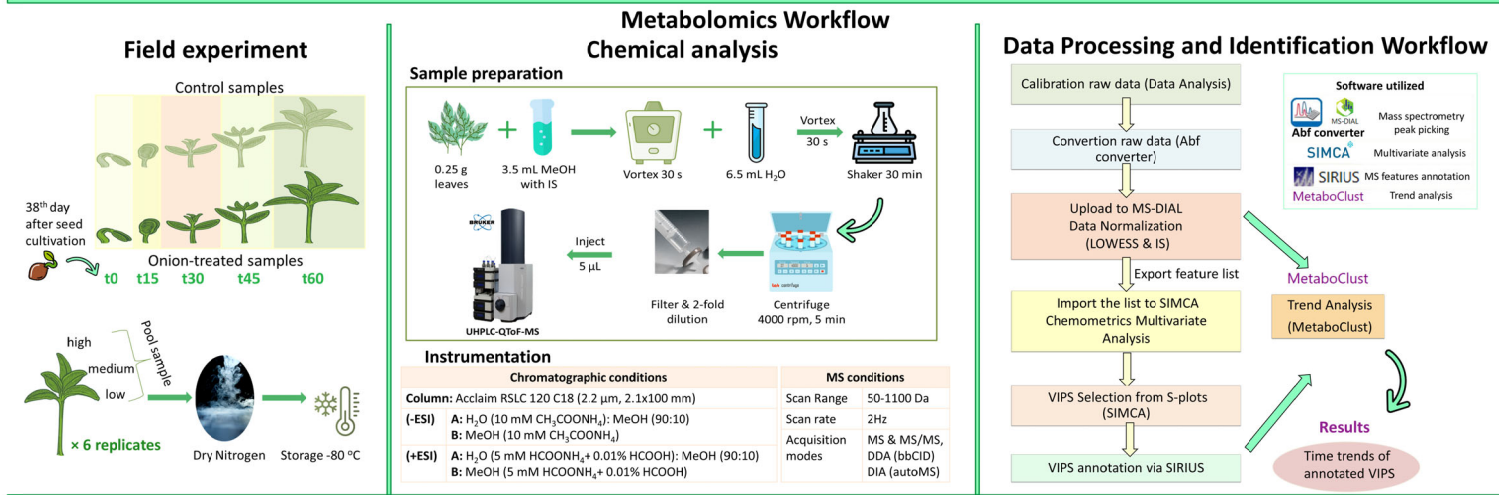
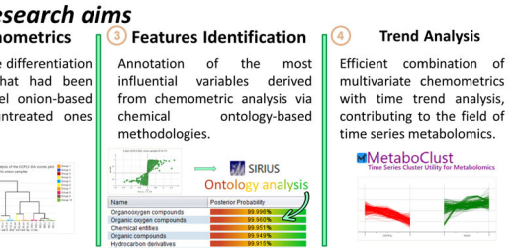
- Worldwide tomato plant's financial importance
- Widespread adoption as a reference organism for -omics analysis

Time points selection

- Covering the whole anticipated developmental stages of the tomato plant's life cycle
- t0, t15, t30, t45, and t60
- t0: 38th day of plant's life

Research aims

- Biofertilizer application**
Irrigation of tomato plant samples with a fully chemically characterized* onion-based fertilizer at the 5 time points (t0, t15, t30, t45, and t60).
- HRMS and Chemometrics**
Examination of plausible differentiation between the plants that had been irrigated with the novel onion-based fertilizer versus the untreated ones (control samples).
- Features Identification**
Annotation of the most influential variables derived from chemometric analysis via chemical ontology-based methodologies.
- Trend Analysis**
Efficient combination of multivariate chemometrics with time trend analysis, contributing to the field of time series metabolomics.



Conclusions

- Differentiation between the control and the onion-irrigated plants was highlighted, via the investigation of a five-time point experiment based on tomato cycle life.
- The identified compounds, belonging to various categories, such as steroidal alkaloids and their glucosides, organic acids, fatty acids, flavonoids, and their metabolites, act beneficially for plant growth.
- These metabolites were derived applying a newly developed workflow combining multivariate chemometrics (O2PLS-DA) and time trend analysis of the most important variables.
- Open-source software employed for peak picking (MS-DIAL), annotation (SIRIUS), and time series monitoring (MetaboClust) facilitates the adoption of the workflow from the scientific community.
- The results indicate that the presence of the identified compounds could ameliorate plant health, paving the way for holistic monitoring of plant growth.

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