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AN OVERVIEW OF INTEVINE: OMICS DATA INTEGRATION IN GRAPEVINE

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We present here the main features and the preliminary results of Intevine, an interdisciplinary research project led by the University of Udine. Intevine shares the vision of the one health approach: living beings (in our case grapevine), are not closed compartments, but are influenced by, and influence, other living beings and the environment. The integration of data from several compartments, representing different physiological, physical or molecular properties may enable a better understanding of complex interactions.

Approximately 100 grapevine cuttings were obtained from Vivai Cooperativi Rauscedo. Of them, 50 were provided untreated, while 50 underwent hot water treatment, a phyto-sanitary treatment to remove common pathogens. Cuttings were planted in 2l pots at the experimental farm of the University of Udine. Three different type of soils were used: peat, peat+farmyard manure, and sand. For each kind of soil, half underwent autoclave sterilization, and half were used as is.

The following data were collected:

1. multispectral images of all plants

2. ionomics analysis of leaves

3. chemical and physical properties of the soil

4. Real time concentration of cations in xylem sap (using bioristor)

5. mRNA-seq of roots

6. 16s sequencing to characterize the prokaryotic community of soil

7. ITS sequencing to characterize fungal community of soil

All the analysis (with the exception of bioristor) were performed on 36 samples, selected as follows: 3 types of soils, 2 soil treatments, 2 root treatments, 3 replicates per condition. Due to limitation in the availability of sensors, bioristor measurements were performed on four replicates each of plants with untreated roots, grown in non-sterilized soil, for a total of 12 plants.

Our preliminary results showed that the different type of soils substantially affected their microbial composition and the transcriptomic pattern of the roots. No strong effect on microbiome composition and root transcriptomics was caused by soil sterilization and hot water treatment of roots.

The type of soil also resulted in different physicochemical properties of soil. In this case, however, the discrimination of the type of soil based on physicochemical parameters was not so clear-cut, probably as a consequence of the low number of measured variables.

The relative abundance of bacterial genera was correlated with physicochemical measures, mainly soil pH, dissolved organic carbon (DOC), dissolved nitrogen (DN), and ATP. Two main patterns emerged. Some genera, such as Chryseolinea and Nitrospirillum were negatively correlated with pH and positively to DOC, DN and ATP; other genera, such as Verrucomicrobium, Pseudomonas and Niabella were positively correlated with pH and negatively to DOC, DN, and ATP.