PROJECT: PHEW

Date: **26.03.2021** **REPORTING**

ID: 452

PROJECT TITLE

Automated phenotyping platform to improve lettuce water use efficiency under different VPD and watering regimens

CONSORTIUM

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SUMMARY OF THE REPORT

Nowadays, about 50% of the global crop yield loss is due to climatic changes; increasing VPD (vapour pressure deficit) and drought are among the principal environmental stressors. In this project, two lettuce cultivars (already characterized under different VPDs in terms of growth, phytochemical composition, and photosynthesis, during previous experiments -*Amitrano et al., 2020; Amitrano et al., 2021*, were evaluated under two different VPDs (low and high) and watering regimes (well-water and drought stress) and then subjected to sudden changes in the VPD. The aim of this high-throughput phenotyping experiment was to study how stomatal regulation (gs) and water use efficiency affect carbon gain and biomass allocation in lettuces adapted to different environmental conditions (VPDs), which developed a different leaf anatomical structure, and then were subjected to sudden changes in VPD. Infrared camera was used to estimate plant-water relationships, RGB imaging was applied to track changes in morphophysiological parameters and fluorescence camera to assess any changes in the photosystem. At the end of the experimental trials, leaf samples were collected in FAA fixative solution and brought to the PWA (Plant and Wood Anatomy) lab of the University of Naples "Federico II" to analyze their morpho-anatomical traits in terms of stomata, veins, and leaf lamina traits through light microscopy. Data from phenotyping and microscopy are being integrated to evaluate how stomatal regulation and carbon allocation can influence lettuce productivity in warmer and drier climates and to understand their dynamic acclimation to sudden changes in the surrounding environment. These results will also be useful to implement growth in controlled environment in support of Space exploration with wide implications also on Earth for sustainable precision farming.