PROJECT TITLE

High throughput PHENOtyping assessment of thermal stress in early seedlings of WILD Mediterranean EDible plants

CONSORTIUM

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SUMMARY OF THE REPORT

This TA project aimed to identify morpho-physiological traits able to assess early seedling growth responses to thermal stress, imposed during the seed germination phase, through automated phenotyping measurements in wild species. In addition, the data on early seedling growth of wild plants taken through the project can help confirming the efficacy of trait assessment by automated phenotyping systems in wild plants, filling the actual gap in the use of this approach for non-crop/model species.

Seeds from seed lots of six wild edible species (*Cichorium intybus, Rumex acetosa and R. acetosella, Sinapis arvensis, Sonchus oleraceus,* and *Trifolium repens*) stored at the Millennium Seed Bank (MSB) of the Royal Botanic Gardens, Kew were used in the experiments, including two seedlots (*S. oleraceus* and *R. acetosella*) collected by the Lebanese Agricultural Research Institute (LARI). To test the applicability of the "Automated plant phenotyping platform for small plants" (APPP-A) at IPK Gaterseleben in wild plants, seeds of each of the six species were divided into two sublots. Half of them (control) were sown individually, directly in 10 cm pots on the carriers of the APPP-A system, where the temperature was set at 20°C. This temperature was identified as optimal for seed germination by preliminary seed germination tests carried out at the seed biology labs of the Royal Botanic Gardens, Kew at Wakehurst. The other half (warming treatment) were sown in a phytochamber set at the optimum temperature increased by 5°C (i.e., 25°C). The applied methods for the automated phenotyping measurements were adapted from the protocol developed for *Arabidopsis thaliana* (Junker et al., 2015). The sensors acquired top view morphological/architectural seedling growth traits (Junker et al., 2015) and estimates of chlorophyll fluorescence parameters (Tschiersch et al., 2017) and images were analysed using the IAP (Klukas et al., 2014). At the same time, a seedling emergence test was also carried out by sowing seeds of the six species in the two chambers, in order to evaluate if the performance and kinetics of the seedling emergence for the six species under the same conditions of substrate/light/temperature applied for seedling growth experiments followed those previously detected for seed germination. Finally, extra seeds were sown at the two temperatures and, after germination followed by one week at 20°C, seedling aerial dry biomass was calculated.

At the moment of the writing of this report, images have just been analyzed. Phenotypic data need now to be inspected and analyzed and therefore it is not possible to comment on the scientific findings of the project yet. However, through this TA project, I have acquired a better understanding of the potentiality (and limitations) of the automated high throughput phenotyping systems and of the additional complexities due to their applications in wild plants.