PROJECT TITLE

Exploiting UV-B radiation to improve cold tolerance in bell pepper seedlings

CONSORTIUM

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SUMMARY OF THE REPORT

Plants can adapt to diverse environmental conditions, but a sudden change in circumstances may result in stress and hindered development. In Europe, bell pepper seeds are traditionally sown indoors, then young plants are transplanted outdoors late spring when colder days frequently occur. Cold is known to stimulate antioxidant defence, ie. the accumulation of secondary metabolites. Survival of a mild stress may result in better tolerating a second stress event. We used three pepper cultivars and performed experiments within the framework of the EPPN2020 Transnational access Phenotyping Project at the Helmholtz Zentrum Munich (HMGU) to explore whether UV-B exposure can be utilized to prime plants to tolerate a subsequent cold stress better. Using various cultivars with distinct phenolic patterns provided an opportunity to study whether stress tolerance depends on base levels or inducible levels of these phenolics. Our laboratory is experienced in the analysis of leaf antioxidant and phenolic responses, and the facility at HMGU provided a unique opportunity to complement such measurements with the analysis of plant growth. This is an often neglected point of stress studies, although from an agronomy point of view acclimation means little loss of biomass as compared to non-stressed plants. Another merit of using the HMGU facility is the possibility to adjust daily changes in environmental conditions gradually. This is a good model for working outdoors but without the unpredictability of weather. The experiment was planned online, and plants were grown for us starting 2/8/21, in the SunSCREEN facility of the HGMU. During our visit, plants of each cultivar were divided into two groups: one group was exposed to UV for 5 days in a SUNSCREEN chamber, the other group kept as controls under identical conditions but without the UV irradiation. Leaf pigments were evaluated periodically and plant growth was followed using a photostation equipped with two CCD cameras in two different angles. At the end of this priming period, randomly chosen 10 plants from each treatment and cultivar group were frozen for further analyses and the rest of the plants were divided again: to be exposed to 15/10°C or kept under 25/20°C. Cold treatment lasted for 5 days, with regular measurements of pigments, determination of leaf photochemistry and recording of growth status. At the end of the experiment, all plants were frozen for further laboratory analyses. A large data set of pigment measurements and photography was acquired, which is still to be analyzed in detail. This, together with the biochemical analysis of stored plant material is expected to broaden our knowledge on the mechanism of UV-priming and cold tolerance. Results, together with those of follow-up experiments will also provide useful protocols for growers as well. Due to the corona restrictions, contrary to the initial planning, our stay was shorter and less participants could join to the research work in Munich.