PROJECT TITLE

Can moderate drought alter the content of volatile organic compounds (VOCs) of tomato cultivars affecting their susceptibility to herbivory?

CONSORTIUM

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SUMMARY OF THE REPORT

The results obtained in these studies, supported by the transnational access EPPN2020, should lead to better knowledge on how to improve the yield of tomato varieties by increasing resistance to insect attack (pipecolic acid was used as a proxy) and adaptation to future drier conditions in many regions. The study will be used to select the most appropriate phenotypes that may help to reduce or eliminate environmentally harmful phytosanitary applications and their associated ecological, sanitary and economic damage and allow growth at lower water availabilities.

Four experimental cultivars were germinated and pre-grown in the greenhouse (12h of daylight, 23-25:17-19°C day/night) and staggered in phases (the same age when entering the ExpoSCREEN). The control cultivar ('Hellfrucht') was grown alongside each cultivar to allow statistical comparison of the data from the different experimental runs in the VOCSCREEN.

Plants were grown in the ExpoSCREEN for 2 weeks (13h of daylight, 27:20ºC, day/night). Then 16 plants of the experimental cultivar and 4 of the control cultivar of roughly equal size were used in the VOCSCREEN. The 4 treatments were denoted in terms of the addition of pipecolic acid (water or pipecolic acid, 200 mg solute into 750 ml (2.06 mmol/L)), kept separate from other plants in another sub-chamber, and drought stress (well-watered or drought-stressed). Drought stress was started in the VOCSCREEN cuvettes.

Before the plants were transferred to the VOCSCREEN chamber, total aboveground leaf area was calculated automatically from photos (each Tuesday afternoon, starting on January 21st). Each plant was placed on a rotating plate and nine photos were taken with two cameras. Then we introduced probes (twisters and SPME) into the substrate to measure root VOC emissions.

The air from inside the VOCSCREEN chambers was continuously sampled for theanalysis of CO_2, water vapor and VOCs (PTR-ToF-MS). In addition, adsorbent filled tubes were sampled for subsequent desorption and analysis of VOCs in GC-MS.

The plants were removed from the VOCSCREEN chambers after a week and leaf area was determined again. Roots were cleaned and fresh plant weight and root volume was measured. Leaf and root samples were taken for metabolomic analyses and root exudates were collected for organic carbon and metabolomic analyses.

The samples for metabolomics analyses were frozen in liquid nitrogen and taken to a freezer at -80 ° C, then lyophilized. Exudate samples for carbon analysis were filtered and frozen. Plant biomass samples were oven dried for 2 days at 65°C and thereafter dry weight was measured.

The samples of VOCs will be analyzed in the Research Unit Environmental Simulation (EUS) Institute for Biochemical Plant Pathology (cartridges and twisters) and in the CREAF (SPMEs). Lyophilized samples will be analyzed later at CREAF and at the Global Change Research Institute, The Czech Academy of Sciences, Brno, Czech Republic.