PROJECT TITLE

Phenotyping tomato lines with mutations in HT1 kinase in ExpoSCREEN platform

CONSORTIUM

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SUMMARY OF THE REPORT

To increase plant growth, tomatoes are commercially grown in greenhouses with elevated CO_2 concentrations. However, elevated CO_2 triggers reduction of stomatal conductance and this could have adverse effects such as increased leaf temperature and reduced uptake of minerals from the soil. Thus, to maximize photosynthetic production, crops that can maintain sufficient stomatal conductance under elevated CO_2 could further improve photosynthetic productivity. Project FutureTomato aimed to study the effects of elevated CO_2 concentration on Wild-type (WT) and genetically edited tomato plants. The edited tomato line has defective HT1 kinase, which makes their stomata insensitive to CO_2 concentration changes.

Figure 1. Photos of the ExpoSCREEN platform at Helmholtz Zentrum München, Germany (from J.B. Winkler, EUS).

The experiment was done at Helmholtz Zentrum Munich from 30.06.21 to 2.09.21, utilizing the ExpoScreen chambers for environmental simulation. Total of 360 plants were grown (180 from each line), divided into three separate experiment rounds in two ExpoScreen chambers.

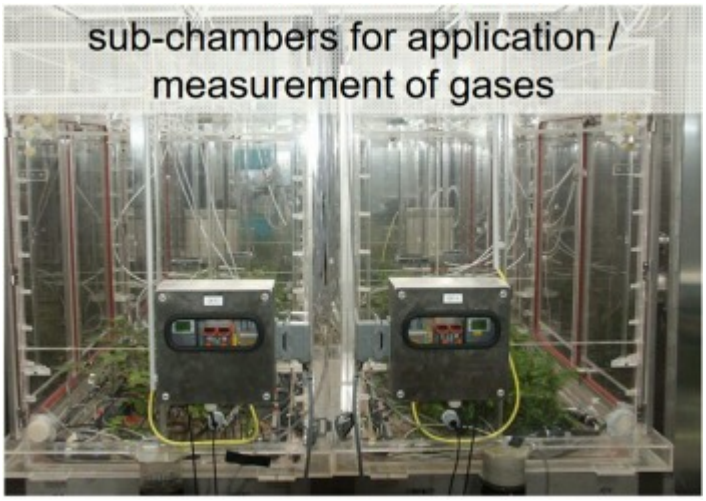

Figure 2. Photo of ExpoSCREEN platform sub-chambers (From J.B. Winkler, EUS).

Each experiment round consisted of 60 WT and 60 mutant plants, 30 of each group received the elevated CO_2 treatment (1050 ppm) while the remaining 30 were kept at ambient CO_2 conditons (450 ppm). During that period the total gas-exchange of each ExpoScreen subchamber was measured continuously, separate gas-exchange measurements and leaf area imaging in the Photostation were done once

a week.

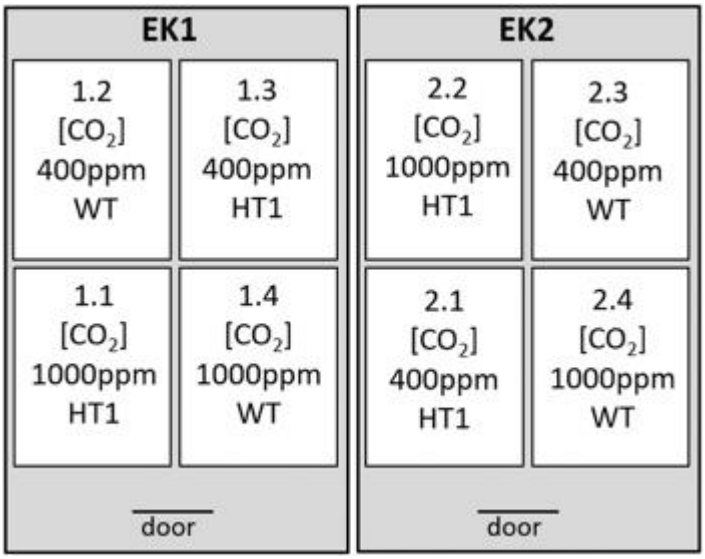

Figure 3. Experimental setup and treatment scheme, showing two ExpoSCREEN chambers (EK1 and EK2) and their sub-chambers. Each sub-chamber has a designated CO_2 concentration and plant line as marked on the figure.

In the end of each experiment the plants were divided into three groups - The first group was harvested for measuring total biomass of the plant shoot, from the second group we took leaf samples and froze them in liquid nitrogen for biochemical analyses, the third group of plants were taken to the greenhouse to grow fruits. Leaf imprints were also taken from 1/3 of the plants to measure stomatal density.