Institute of Biological Production Systems
Vegetable Systems Modelling

Leibniz Universität Hannover

Response of Tomato Introgression Lines to Low Root Zone Temperature and Drought

Background

Low root zone temperature (RZT) and drought can hamper tomato (*Solanum lycopersicum* L.) growth, development and biomass production. Low RZT also limits growing season and region or increases the cost of energy inputs in greenhouses.

Introgression lines (IL) with quantitative trait loci (QTL) for cold tolerance have already been identified in a *S. lycopersicum* x *S. habrochaites* IL-library.

Tomato plants in the greenhouse

Objectives

The main objective of the study is to examine the genetic and physiological basis of cold and drought tolerance in tomato.

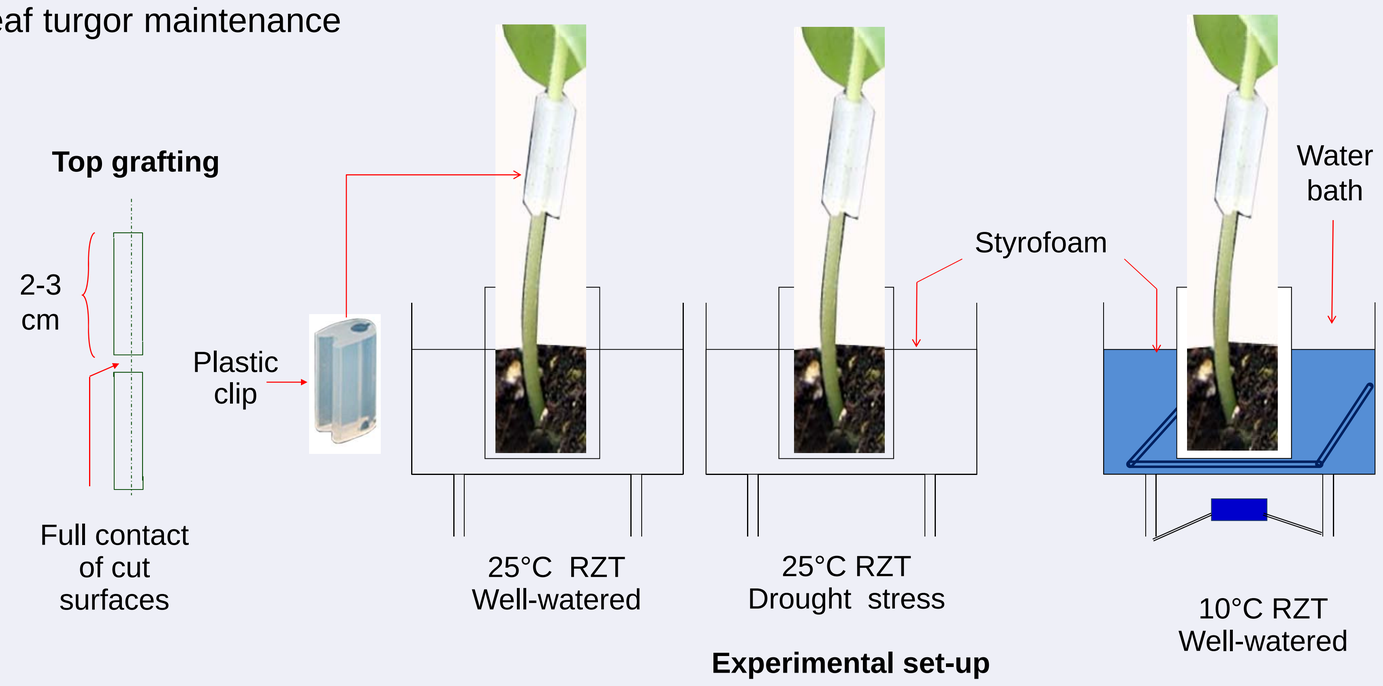
One aim is to test whether chilling tolerant genotypes accumulate more ABA in roots and leaves, which could lead to changes in stomatal conductance under low RZT and drought. Low RZT and drought may also result in leaf turgor maintenance and reduced wilting in tolerant genotypes.

Materials and methods

Four different scion/rootstock combinations were prepared:

1. Recurrent parent (RP) to RP (RP/RP)
2. RP to introgression line IL45 (RP/IL45)
3. IL45 to IL45 (IL45/IL45)
4. RP to donor (RP/D)

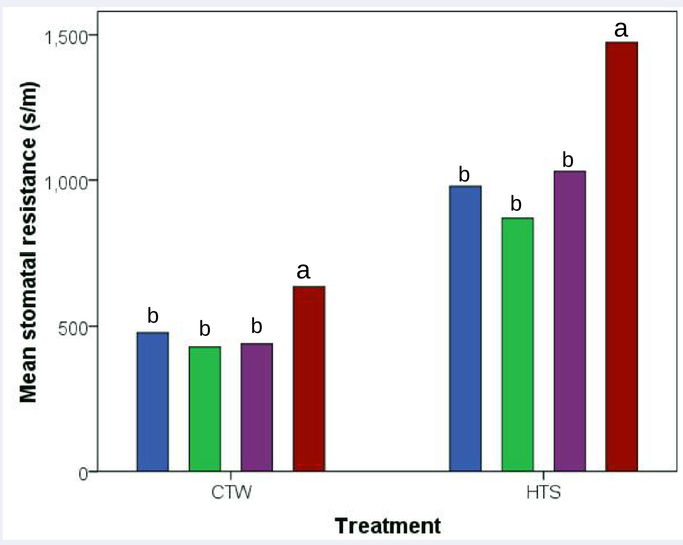
Plants were grown for about 5 weeks and harvested to measure leaf area, dry mass, stomatal conductance, etc.

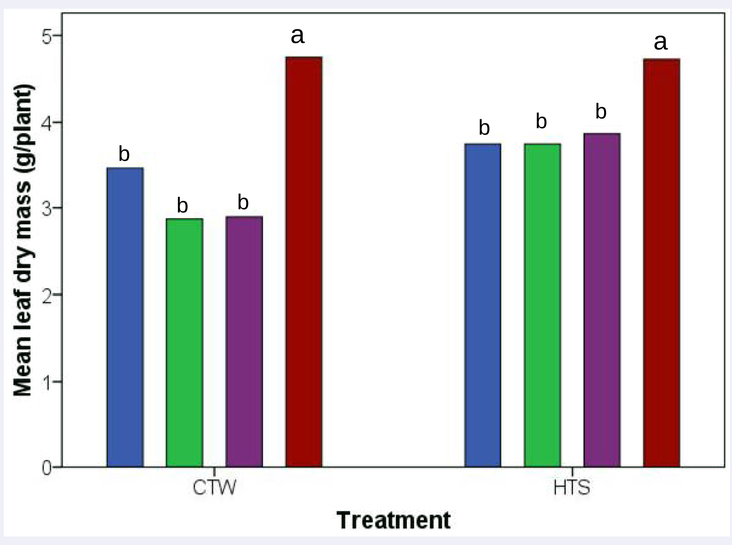


Experimental set-up

Results

- ✓ Increment in total leaf area resulted into positive linearity with leaf dry mass produced in each treatment and graft combination.
- ✓ Differences in leaf area and dry matter of graft combinations RP/RP, RP/D and IL45/IL45 were statistically not significant. Nevertheless, the RP/IL45 combination produced significantly higher leaf area and dry mass.
- ✓ The mean value of leaf area and dry mass was highest in the well-watered treatment with high RZT.
- ✓ Level of stomatal resistance was significantly higher in the graft combination RP/IL45.





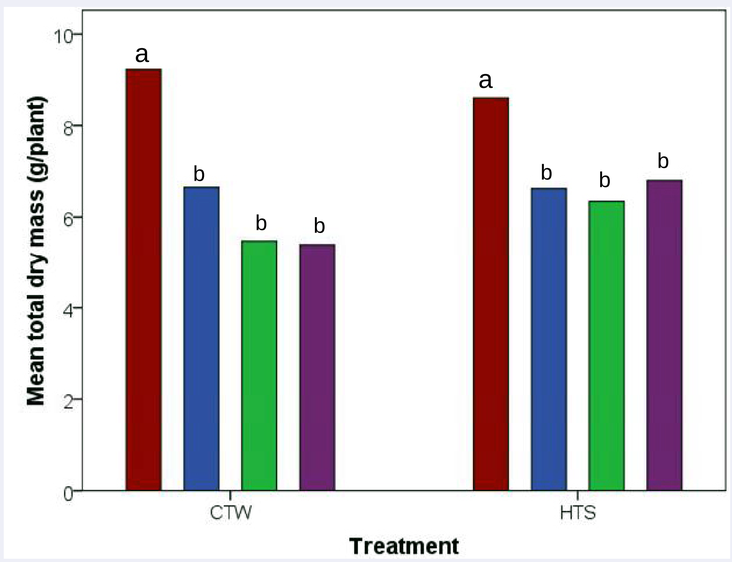
Legend

Graft combination

- RP/IL45
- IL45/IL45
- RP/RP
- RP/D

CTW: Low root zone temperature and well-watered
HTS: High root zone temperature and drought stress

Different letters above bars indicate significant difference among graft combinations within each treatment at p<0.05.



Conclusion

The highest stomatal resistance in the recurrent parent/introgression line combination also resulted into the highest assimilate production. Probably introgression of favourable genes from *S. habrochaites* can improve cold and drought tolerance of cultivated tomato.

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