

Transnational Access Report

1. General Information

Project Acronym (ID):	ROOTUBERPHENOM
Project Title	Interactive effects of drought and salt stress on root development in potentially salt resistant landraces of tomatoes, as well as characterization of tuber production by various somatic hybrids of potato under greenhouse conditions
Installation used	HAS-RSDS
Name of Group Leader	Prof. Elena Rakosy-Tican*; Dr. Cosmin Ionel Sicora**
Name of organization	*Babes-Bolyai University Cluj-Napoca, Plant Genetic Engineering Group; ** Biological Research Center Jibou, Romania

2. Project summary (max. 250 words)

One of the important environmental conditions which affect plant growth is salinity. Salinity acts similarly to drought on plants, preventing roots from performing their osmotic activity. Therefore, due to increased levels of salinity in the soil water and nutrients cannot move into the plant roots. In some cases, salinity also has a toxic effect on plants because of the high concentration of certain salts in the soil.

One main objective of the present project was to monitor the development of the root system of the selected landraces of tomato under different combinations of water and salt stress levels with the use of the HAS-RSDS root phenotyping platform. Basic parameters, such as root density was monitored from the seedling stage to well developed adult plants.

The other main objective of the project is to provide a phenotyping characterization of tuber production of somatic hybrids between potato and *S. bulbocastanum*, or *S. chacoense*, with or without MMR deficiency under conditions of drought stress. MMR means DNA mismatch repair and involves many proteins; in our material MMR deficiency was induced by introducing antisense or complementary negative *Atmsh2* gene, the gene coding for the key protein in MMR. The phenotyping aims to evaluate the differences between genotypes and the “mutator” phenotype associated with MMR deficiency in relation to tuber production.

Since water and salt stress, as well as the somatic mutations affect not only root development, but also shoot development in a connecting project the shoot responses to salinity and drought were analysed as well by using the HAS-SSDS platform with the same cultivars and under similar conditions that are used for the root phenotyping in this project.

3. Main achievements (max. 250 words)

For the tomato sub-project changes in the root density, at the side and bottom surfaces of the transparent growing pots, was analyzed. It was found that under well watered conditions (60% soil water content) the presence of 0.2% salt did not induce significant effect on the root density. Decrease of soil water content alone induced some increase of root density, while the combination of water limitation and salt increased the root density significantly. It appears that under these conditions the enhanced root growth was able to largely compensate the effect of salt since in the green shoot/leaf area the salt effect was not too serious. In case of 0.3% salt content the root density was significantly induced by water limitation, but the presence of higher amount of salt largely compensated this effect. Still the root density was higher in the salted and water limited soil than in the well watered control without salt. Interestingly, in spite of the high root density the water uptake was highly suppressed when water limitation was combined with high

salt content.

In case of the potato sub-project it was observed that the water limited conditions decreased the total weight of tuber production significantly in all hybrid lines. The highest level of tolerance was observed in the MMR deficient somatic hybrids (SH) with *S. chacoense* Dk.S10.40 (56%), DK.P11.24 (58%) and 2282/4, a SH with *S. bulbocastanum* (75%), while the most sensitive lines were 2299/2 (3%) and 2295/1 (7%) (both involving *S. bulbocastanum*). The presence of the tubers seems to compensate water scarcity in some of the hybrids which have other interesting resistance traits, like resistance to Colorado beetle or late blight.

4. Publications related to the access granted, acknowledging the support by EC.

Denes Tunde-Eva, Genetic stability of somatic hybrids between *Solanum tuberosum* cv. Delikat and *Solanum bulbocastanum* and their response to different stress factors, PhD thesis to be defended 17th of December 2015, Babes-Bolyai University Cluj-Napoca