

Transnational Access Report

1. General Information

Project Acronym (ID):	SHVEGRACEPHENOM
Project Title	Phenotyping of selected somatic hybrids potato (+) resistant wild species, as well as of potentially salt resistant landraces of tomatoes, in normal growth conditions, drought and salinity stress
Installation used	HAS-SSDS
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)

Potato crop is very sensitive to both biotic and abiotic stress but its wild relatives contain many resistance genes which represent a reservoir for potato improvement. Many of these species are sexually incompatible with the crop. On the other hand classical breeding takes a very long time. We wanted to test the hypothesis that durable resistance to multiple stress factors can be achieved by somatic hybridization by applying complex plant phenotyping coupled with resistance gene characterization. DNA mismatch repair (MMR) is thought to increase both mutations and prevent mitotic or meiotic homeologous recombination. MMR deficiency will induce new variation and increase the introgression of genes from closely related species.

We aimed to develop a phenotype screening of the best hybrids, in relation to resistance traits, to compare their growth habit, morphology, flowering, biomass production, drought tolerance and photosynthesis.

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.

The objectives of the proposed research project are:

- Phenotyping selected somatic hybrids and back-cross progenies of potato + *S. bulbocastanum* (blb) for potato-like morphology and biomass
- To analyze the effects of MMR deficiency on selected somatic hybrids potato + *S. chacoense*, on growth and physiological parameters and drought tolerance in comparison with parental genotypes.
- The data are going to be compared and integrated with molecular analysis, resistant gene characterization, resistance to *P. infestans* in detached leaf assay and field, or resistance to Colorado potato beetle, in the two somatic hybrids combinations, respectively, productivity in the field and cytogenetic characterization (GISH and FISH).
- To analyse the effect of salinity and drought stress on selected Romanian landraces of tomato.
- To search for correlation between drought- and salt tolerance in selected tomato landraces.
- To analyse the synergistic effect of salinity and drought stress on plant growth and development.

Since drought and salt stresses affect not only shoot development, but also root development, in a connecting project we analyzed the responses of the root system in the same cultivars and similar conditions that are used for the shoot phenotyping in the present project.

3. Main achievements (max. 250 words)

In the potato sub-project we observed significant retardation in the growth of the above ground green leaf/shoot area and water limiting conditions (30% soil water content). However, in case of some plant lines (2295/1, 2299/2, 2283/9/3), representing somatic hybrids with *S. bulbocastanum*, the retardation effect was almost negligible. In comparison to tuber formation we can conclude that in case of some lines the drought effect on the shoot and tuber development correlated with each other (2283/9 and Dk.S10.40) showed relatively large shoot area and tuber weight, while in others (e.g. 2299/2 although the above ground shoot development was not much affected tuber production was seriously retarded by the water limitation.

In the tomato sub-project we found that the presence of 0.2% salt in the soil did not induce significant difference in the growth of plants under well watered conditions (60% soil water content). On the other hand the presence of salt induced a 20-40% decrease of green shoot/leaf area under water limiting conditions (20% soil water content). When the amount of salt in the soil was increased to 0.3% a significant decrease of green shoot/leaf area was observed even under well watered conditions. Best tolerance against the effect of salt was observed in case of the Cefa7 and Marmande varieties. The water uptake was also monitored during the experiment. It was very interesting to observe that the presence of salt in the soil seriously limited the water uptake in all four varieties. This effect was significantly enhanced under 0.3% salt content.

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