Transnational Access Report

1. General Information

Project Acronym (ID):	Mitochondia and drought
Project Title	Analysis of mitochondrial functions in drought tolerance
Name of Group Leader	László Szabados
Name of organization	Biological Research Centre, Szeged, Hungary

2. Duration of access

Begin of the project	End of the project
2014.03.14.	2014.07.18.

3. Project summary (max. 250 words)

Adaptation to extreme environmental conditions such as drought, high and low temperatures, soil salinity is essential for higher plants, and is controlled by complex regulatory processes. During adaptation to abiotic stress conditions mitochondria regulate important segments of cellular metabolism including respiration and oxidative phosphorylation; metabolism of proline and ascorbate; and control of redox balance. Reactive oxygen species (ROS) can be produced in the mitochondrial electron transport chain under stress, where Complex I and Complex III are the major sites of ROS synthesis. Stabilization of the electron flow in the mitochondrial electron transport chain is therefore important to control redox balance, to reduce oxidative damage and to support photosynthesis during stress.

The present project was designed to better understand the importance of mitochondrial respiration and electron transport on abiotic stress responses in higher plants. 11 different T-DNA insertion mutants of the model plant *Arabidopsis thaliana*, with disrupted genes encoding mitochondrial proteins and transgenic line overexpressing one of the studied protein were subjected to gradual drought and salt stress. Growth and physiological parameters were recorded for seven weeks using non-disruptive imaging technologies. Subsequent data analysis revealed differences in selected parameters, suggesting that some of the studied genes can influence responses to drought and salinity.

4. Main achievements (max. 250 words)

The experiment gave complex information about the drought and salt stress responses of 11 Arabidopsis mutants by measuring a number of phenological and physiological characters in controlled growth conditions using non-destructive methods. According to our knowledge, similar study has not been performed before. One of the conclusions were, that salt stress had a stronger effect on plant growth than drought stress and revealed more striking differences between individual mutants. Several salt-stressed mutants had altered leaf area, number of leaves, plant diameter when compared to wild type. These characters in drought-stressed plants were less variable, nevertheless several mutants with differences in these characters were found. The *ppr40-1* mutant had inferior growth in all conditions and was hypersensitive to both stresses. The *ndusf8a-2*, *ndufa9* and *fpb4-2* mutants had superior leaf area and plant diameter than wild type ones when were subjected to drought. Salt stress affected more the growth of *fpb4-1*, *fpb4-2* and *mppß* mutants. Among the physiological characters, changes in Fv/Fm were monitored. Although differences in this feature were not outstanding, salt treatment provoked changes in several mutants, which could indicate altered sensitivity.

Data obtained in the EPPN system were compared to our previous data obtained in sterile conditions. Although such studies are still in progress, we could conclude, that the differences between mutants and wild type plants, often cannot be reproduced in sterile conditions and in soil-grown plants. Such observations confirm the importance to use complex phenotyping in systematic analysis of stress responses in higher plants.

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

Evaluation of the results is still in progress. We are planning to publish the results in a scientific paper and present in international congresses next year.