

Summary of Transnational Access Report to ExpoSCREEN

1. General Information

Project Acronym (ID):	ROS-Sensing
Project Title	Establishing the genetic basis for reactive oxygen species perception in <i>Arabidopsis</i> using a knockout collection of cysteine-rich receptor-like kinases and natural variation of worldwide accessions
Name of Group Leader	Jaakko Kangasjärvi
Name of organization	University of Helsinki
E-mail address	jaakko.kangasjarvi@helsinki.fi

2. Access duration

Begin of the project	End of the project
2.5.2012	29.8.2012

3. Project summary (max. 250 words)

Ozone (O₃) induces biochemical responses, such as apoplastic reactive oxygen species (ROS) production, similarly to pathogen attack. In response to stress plants activate specific and general signaling pathways ultimately leading to transcriptional reprogramming and adaptation to the stress.

We conducted a series of experiments to understand the genetic basis of perception of reactive oxygen species in the ExpoScreen facility, HMGU, Munich. Three weeks old *Arabidopsis thaliana* plants were ozone fumigated (350ppb, 6h) and the tissue damage was either measured with ion leakage or by visual inspection.

Several Cysteine-rich receptor-like kinases (CRKs) in *Arabidopsis* have been recently reported to be transcriptionally regulated by a variety of stresses (Lehti-Shiu et al., 2009). The CRK subfamily is defined by the presence of a conserved cysteine motif in the extracellular domain. Recently, we have identified several CRKs to be transcriptionally regulated in response to ozone (Wrzaczek et al., 2010). The screen for O₃ sensitivity in the facility in Munich will allow us to investigate the physiological role of the CRKs in ROS perception and signalling beyond transcriptional regulation.

As an alternative to mutant screening we used genome wide association mapping to find genes underlying plant stress responses. Simultaneous ozone exposure of 131 *Arabidopsis* accessions is expected to improve the accuracy of phenotyping and genome wide association mapping. With the accession screen we have found new candidate genes affecting the natural variation for O₃-induced cell death and stomatal signalling in *Arabidopsis thaliana*.

4. Main achievements (max. 250 words)

To assess the ozone sensitivity of the crk lines, 18-old day plants have been fumigated with ozone (350 ppb, 6h) and cell-death was quantified by measuring ion leakage. The screening allowed us to identify interesting crk candidates, which were more sensitive to ozone compared to Col-0. Moreover, these results confirmed the importance of CRK in the ROS perception/signaling pathways. Further analyses are needed to establish now how the identified CRKs participate in these processes and how their cytoplasmic signalling activity is regulated and how signals are transduced to cytoplasmic or nuclear proteins.

To further understand natural variation in *Arabidopsis thaliana* for ozone induced cell death we performed genome wide association analysis. We found that natural variation for ozone induced cell death is likely governed by several genes with relatively small effect. With this accession screen we were able to identify a small number of candidate genes that likely explain part of the variation. These genes are involved in RNA-binding in nucleus, MAP kinase activity and regulation of stomatal density.