Identification of genes that regulate plant tolerance to adverse abiotic factors and determine plant aging

Tsanko Gechev

Midterm Meeting, BSRP, Sofia 20.05.2014

Project data:

Project number and name: Grant No. IZEBZ0_143003/1

Identification of genes that regulate plant tolerance to adverse abiotic factors and determine plant aging

Duration: 1.11.2013 – 31.10.2015

Budget: 359,954.00 CHF (179,864.00 CHF for the Swiss partner, 180,090.00 for the Bulgarian partner)

Swiss PI: Prof. Dr. Stefan Hörtensteiner, Institute of Plant Biology, University of Zurich (UZ), Zollikerstrasse 107, CH-8008 Zurich, Switzerland having the bank account no 1100-0109.594 (ZKB Zurich) (account of the University of Zurich)

Bulgarian PI: Prof. Dr. Tsanko Gechev, Institute of Molecular Biology and Biotechnologies (IMBB), 105 Ruski Blvd., 4000 Plovdiv, Bulgaria

Project goals:

•To uncover molecular mechanisms that regulate drought/low temperature stress tolerance in plants

•To identify genes that modulate plant lifespan

•To educate 3 PhD students.

Technology: A suite of genetic, genomics, molecular biology and physiology methods:

-Genetic analysis (the Arabidopsis *atr2* mutant has extended lifespan)
-Comparative transcriptomics (RNA-seq, qRT-PCR) and metabolomics (GC/LC-MS) of species with different levels of stress tolerance (*A. thaliana, H. rhodopensis, T. halophila*).

Expected impact:

•Scientific field and agriculture/economy:
Identifying new genes involved in the regulation of plant abiotic stress tolerance and unraveling the genetic mechanisms of plant ageing is of fundamental importance and practical significance for generating crops with improved qualities and increased productivity.

•Impact on research capacity/educating young scientists:
3 young researchers/PhD students (two in IMBB, one in UZ).

•Impact on collaboration between institutes/networking:

- Establishment of a long-term collaboration between UZ and IMBB.
- Collaboration with the Max Planck Institute of Molecular Plant Physiology (MPIMP), Golm, Germany.

Outcomes: Four papers in peer reviewed scientific journals with **medium to high impact factors** have been published so far. Two of them were published in 2013 and listed in the first annual report; the other two were published in 2014:

Gechev TS, Hille J, Woerdenbag HJ, Benina M, Mehterov N, Toneva V, Fernie AR, Mueller-Roeber B (2014) Natural products from resurrection plants: Potential for medical applications. Biotechnol Adv. doi: 10.1016/j.biotechadv.2014.03.005. (Open access, ISI Impact Factor 10) http://www.ncbi.nlm.nih.gov/pubmed/24681091

Benina M, Obata T, Mehterov N, Ivanov I, Petrov V, Toneva V, Fernie AR, Gechev TS (2013) Comparative metabolic profiling of *Haberlea rhodopensis, Thellungiella halophyla*, and *Arabidopsis thaliana* exposed to low temperature. Frontiers Plant Sci. 4: 499 (Swiss open access journal) http://www.ncbi.nlm.nih.gov/pubmed/24376451

Gechev T, Mehterov N, Denev I, Hille J (2013) A simple and powerful approach for isolation of *Arabidopsis* mutants with increased tolerance to H_2O_2-induced cell death. Methods Enzymol. 527: 203-220. http://www.ncbi.nlm.nih.gov/pubmed/23830633

Christ B, Egert A, Süssenbacher I, Kräutler B, Bartels D, Peters S, Hörtensteiner S (2014) Water deficit induces chlorophyll degradation via the "PAO/phyllobilin" pathway in leaves of homoio- (*raterostigma pumilum*) and poikilochlorophyllous (*Xerophyta viscosa*) resurrection plants. Plant Cell Environ. (accepted) http://www.ncbi.nlm.nih.gov/pubmed/24697723

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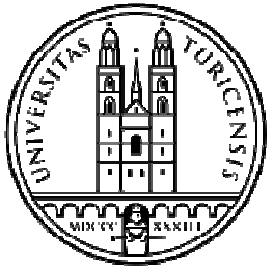

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