plant survival under salinity requires high cytosolic K^+/Na^+ ratio. The restriction of Na+ transport and accumulation in photosynthetic organs and enrichment of plant tissues by K^+ are very promising approaches for plant salt tolerance improvement. Both these processes recruit a range of transporter and their controllers at both plasma membrane and tonoplast. Thus the one of major mechanism of salt tolerance rely on regulation of function of Na^+ and K^+ transporters. The application of most important transporters that facilitate intra- and intercellular Na^+ and K^+ in plants will be discussed. According to the proposed approach, we have cloned several genes encoding key transporters of Na+ and K^+ comprising NHX (Cation proton exchanger), HKT (High affinity K^+ transporter) and TPK (Two-pore potassium channels) families. By application of transgenic approach for expression or overexpression of these genes, the improvement of salt and in some cases osmotic tolerance was achieved in rice, barley and tobacco plants. The our study demonstrate that the regulation of function and modulation of gene expression of some plant transporters, HKT for Na^+ and NHX and TPK for K^+ homeostasis, are effective approach for salt tolerance crop improvement. The regulation and function of HKTs, NHXs and TPKs and their response to salinity will be discussed in this work. Thus regarding our research direction together with study of other plant scientist, the plant biotechnology needs to introduce correct combination of promising genes into novel crop cultivars. The genes encoding transporters involved in Na^+ and K^+ transport could be very useful for future application and improvement of crop salinity tolerance.

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NITRATE-DEPENDENT FORMATION OF NITRIC OXIDE AND ITS PARTICIPATION IN INDUCTION OF HEAT RESISTANCE OF WHEAT SEEDLINGS

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Nitric oxide (NO) is the important participant of signaling in plant cells. It is established that NO is involved in the signal transduction to the genetic apparatus, that is required for developments of plants resistance to adverse factors of various nature, including hyperthermia. The induction of plant resistance to different stress factors by influence of various donors of nitric oxide is shown. In recent years the experimental data about the significant (probably, dominant) contribution of the pathway of nitrates reduction with the participation of nitrate reductase (NR) to nitric oxide synthesis have been obtained. Also there are numerous facts indicating the existence of pathway of NO formation from L-arginine at involving of protein with NO-synthase activity. Possible reciprocal influence of these pathways on the content of nitric oxide remains almost not investigated. Also the contribution of pathway of nitric oxide synthesis with NR participation in the formation of adaptive responses of plants is investigated a little.

The study of influence of sodium nitrate on the activity of NR, endogenous content of nitric oxide (NO) in roots and development of the wheat seedlings resistance to the damaging heating was the purpose of current research. Also the influence of exogenous L-arginine on the nitrate-dependent formation of NO in root cells and development of seedlings resistance to hyperthermia was investigated.

Etiolated seedlings of soft winter wheat (*Triticum aestivum* L.) of variety Doskonala, which were grown at the temperature of 22°C on the purified tap water, served as experimental object. Seedlings were incubated during 24 hours on 20 mM of sodium nitrate solution (optimum concentration was chosen in preliminary special experiments). In separate series of experiments the effects of 20 mM of sodium nitrate in combination with 5 mM of L-arginine, 5 mM of sodium tungstate (NR inhibitor) or 100 μM of PTIO (NO scavenger) were investigated. The content of NO and activity of NR were measured in roots of seedlings. After 24 h of incubation with the studied solutions the seedlings were exposed to the damaging heating (10 min at 46°C).

The treatment of seedlings with nitrate caused the transitional increase of NO generation and rise of NR activity with peak on 2-4 h after treatment starts. The resistance of seedlings to the damaging heating increased under the nitrate influence. All indicated effects were removed under the treatment of seedlings with NR inhibitor sodium tungstate. The positive influence of nitrate on the heat resistance of seedlings was leveled by the influence of PTIO. The effect of nitrate on the NR activity, nitric oxide content and resistance of seedlings to heat stress was substantially leveled under the influence of L-arginine, which also possesses an ability to raise the NO content in roots and to induce the development of heat resistance. The conclusion about the significant role of nitrate-dependent formation of NO in the induction of heat resistance of wheat seedlings and about the antagonistic effects of nitrate and L-arginine is made.

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CADMIUM AFFECTS *ARABIDOPSIS THALIANA* PROTEOME

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Because of human activity, cadmium (Cd) has become a widespread non-essential heavy metal, one of the most toxic to all living organisms. It is a dangerous environmental pollutant, with relative high mobility in the soil-plant system and ability to interfere with plant metabolism (Gzyl et al., 2015). Aim of our research is to study adaptation of *Arabidopsis thaliana* seedlings to cadmium ($CdCl_2$).

For this purpose three lines of *Arabidopsis* (Columbia, Oasis and Chernobyl 7) were grown on S MS containing 0,3 % (w/v) phytogel (Phytogel, Sigma, USA) and 0,5% (w/v) sucrose with and without addition of $CdCl_2$ salt (100 μM). The whole 10-day-old seedlings with roots and leaves were used for protein extraction, carried by phenol-based protocol. Protein concentration was determined using a protein assay from Bio-Rad (Hercules, CA), based upon the modified procedure of Bradford. Then the 2-D electrophoresis was performed. For the isoelectric focusing (IEF) 50 μg protein of samples was loaded on the IPG strips with pH 5-8 (7 cm, Bio-Rad, Hercules, CA) and placed into an isoelectric focusing (IEF) unit (Protean IEF Cell, Bio-Rad, Hercules, CA) for 16 h. After that strips were placed on the top of an acrylamide SDS-gel. Second dimension separation was carried out using a Protean II xi Cell (Bio-Rad, Hercules, CA) for 2 h (Hajduch et al., 2005). Protein 2-DE gels of each line of *Arabidopsis* were matched individually to the reference gel in biological triplicate using PDQuest software (BioRad, USA). Only 2-DE spot that were presented in both data sets (i.e., control and cadmium treatment), and in each data set, and at least in two biological replicates were included in the analysis (Valedor and Jorrin, 2011). In total, 193 2-DE spots for Columbia line, 204