lutions of polyethylene glycol 6000 with osmotic pressure ranged from -0.1 to -0.4MPa, were determined. It was found that the suppression of coleoptile's growth by 50% in comparison with control values occured upon osmotic pressure of -0.3 MPa, while the root length remained at the control level. In our opinion, the metabolic changes are directed toward the formation of protective reactions under given conditions in plant organism. Therefore, in order to carry out further investigations, the concentration of PEG -0.3 MPa was chosen.

The analysis of the obtained results allowed to determine the studied varieties according to the level of drought resistance in the early stages of ontogenesis. So, varieties Holikovs`ka, Favorytka (non-sensitive) and Trypil`s`ka (sensitive) were selected for further research.

The investigation of growth reactions and parameters of water consumption was conducted on 7-day wheat seedlings of selected varieties, which were cultivated under osmotic pressure of -0.3 MPa. Analysis of the morphometric indexes of plants indicates an insignificant inhibition of leaves growth of seedlings of Favorytka variety along with an increase of root length in 2 times. Decreasing of the leaves length of Trypil`s`ka variety was admitted under conditions of osmotic stress. At the same time significant changes of values of growth indexes of the roots were not found in these conditions. Also, morphometric parameters of seedlings of Holikovs`ka variety had not been affected.

The expected decrease of relative water content in leaves of wheat plants and accumulation of proline occurred under conditions of osmotic stress. It was revealed that proline content ratio in roots and leaves was approximately 10:1 for Favorytka and Trypil`s`ka varieties. However, there was no significant difference between proline accumulation in leaves and roots in Holikovs`ka variety, which indicated constitutive resistance to osmotic stress.

Kovaleva V., Yusypovych Yu., Gout R.

SCOTS PINE DEFENSINS: STRUCTURE, PROPERTIES AND BIOLOGICAL FUNCTIONS

Національний лісотехнічний університет України
вул. Ген. Чупринки, 103, м. Львів, 79057, Україна
e-mail: kovaleva@nltu.edu.ua

Evolutionary plants developed multilayer system for protection against potentially pathogenic organisms, which includes mechanical cell wall barriers as well as a broad range of compounds with antibiotic activity. Among the latter, plant defensins are a conservative group of antimicrobial peptides that is a component of innate immunity of many classes of living organisms, including humans. Plant defensins form a large family of small (45-54 amino acids), basic, cysteine-rich proteins. They share a common three-dimensional structure comprised of three antiparallel β–strands and one α-helix held together by four or five disulfide bridges formed by conserved cysteine residues. Conserved disulfide bonds are also proposed to define physico-chemical properties of defensins, such as an extreme resistance to high temperatures and acidic environments.

Plant defensins are arranged in multigene families and are overrepresented in the genome of some plants species. That is particularly well illustrated in *Arabidopsis thaliana* and *Medicago truncatula* where comparative sequence analysis of the sequenced genomes revealed that there are several hundred defensin-like genes present in these plants alone. Recently we found a multigene family of these proteins in Scots pine. Six

defensin genes: *Ps*Def1-4, *Ps*Def5.1 and *Ps*Def5.2 were cloned and these nucleotide sequences deposited in the database GenBank.

The analysis of Scots pine defensins using the neighbor-joining method reveals two subgroups. The first subgroup includes *Ps*Def1, *Ps*Def2, *Ps*Def3 and *Ps*Def4, which have high sequence similarity (88-96 %). The second subgroup consists of *Ps*Def5.1 and *Ps*Def5.2, the identity between them is 96 %. Scots pine defensins from different subgroups have lower sequence similarity (46-52 %) and less number of residues that are conserved.

To elucidate the biological activities of pine defensins, one of them is PsDef1 was purified from seedlings and its recombinant analog was obtained by heterologous expression in the bacterial system. Like most plant defensins, endogenic and recombinant *Ps*Def1 showed high activity against fungi, they arrested the growth of *Botrytis cinerea, Fusarium oxysporum, Fusarium solani, and Heterobasidion annosum* at protein concentrations less than 1 μM. Furthermore, this peptide inhibited the growth of other pathogenic microorganisms, in particular, gram-positive and gram-negative bacteria of the genera *Bacillus, Pseudomonas, and Pectobacterium*. In addition, we found that *Ps*Def1 inhibits α-amylases of pine beauty, a dangerous pine pest. To the best of our knowledge, *Ps*Def1 is the first defensin from gymnosperms, for which such broad spectrum of biological activities has been described.

To clarify the biological functions of the Scots pine defensin genes, we performed a transcriptome analysis of these genes in the vegetative and generative organs of Scots pine plants of different age and under abiotic and biotic stresses. We found that the only gene that is expressed everywhere in the pine tissues is *PsDef1*. The expression of other defensin genes from Scots pine was organo-specific and developmentally regulated. We revealed features of Scots pine defensin gene expression in the response to different types of infection, such as biotrophy, hemibiotrophy, and necrotrophy. We showed that abiotic stresses including salt, cold, water and heat modify the level of expression of defensin genes in Scots pine seedlings.

The obtained results demonstrate that Scots pine defensins are the important component of host defense providing resistance of Scots pine to environmental stresses and can be of great practical interest for the development of eco-friendly biotechnologies for forest protection.

Козеко Л.

ДИНАМІКА СИНТЕЗУ HSP70 У ЗВ'ЯЗКУ З АДАПТИВНОЮ ЗДАТНІСТЮ ВИДІВ РОСЛИН

Інститут ботаніки ім. М.Г. Холодного НАН України
вул. Терещенківська, 2, м. Київ, 01601, Україна
e-mail: liudmyla.kozeko@gmail.com

Kozeko L. DYNAMICS OF HSP70 SYNTHESIS IN CONNECTION WITH ADAPTABILITY OF PLANT SPECIES. Plants of different adaptability were subjected to prolonged influences of high temperature (37°C) and soil flooding. Western blot-analysis of HSP70 in leaves during the period of exposure showed that the constitutive level and ability to high and extended HSP70 induction underlies the survival and successful adaptation of plants in variable environment.