in tap water. The cuvettes were in a TS-80M-2 thermostat. The temperature was maintained at +20° C.

The germination energy and laboratory sprouting were determined according to the requirements of National Standard GOST 12038-84. The degree of swelling was determined according to U. Ruge in the presentation of O.A. Walter et al. [2].

Morphometric parameters were assessed according to standard methods in plant physiology. The statistical processing of the results was carried out using the Student's coefficient.

As a result of studying the influence of salts on the degree of swelling of *Pisum sativum* L. seeds, the Arpha variety, we found that the processes of water supply to pea seeds were slowed down. Swelling rate in variants of 50 mM NaCl as compared with the control was reduced by 5.5%, and at a concentration of 200 mM NaCl – by 12.1%, respectively.

With increasing osmotic stress, the swelling intensity of pea seeds also decreased. If in the control the intensity of swelling reached 150.7%, then at a concentration of 200 mM NaCl this figure reached only 132.7%.

It was found that under the conditions of osmotic stress, the most intensive swelling was noted in the first 4-8 hours of seed soaking; 12 hours after soaking (the second stage of germination – preparation for cell stretching) a lag-period was observed, during which the rate of water absorption, ATP in all studied variants was not changed. In this case, the difference in the decrease in the index between the control and trial variants persisted throughout the experiment.

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CATIONIC AND METABOLOMIC CHANGES IN BUCKWHEAT (FAGOPYRUM ESCULENTUM MOENCH) PLANTS UNDER THE NACL INFLUENCE

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Soil salinity adversely affect the growth and development of many agricultural crops, and most importantly – their productivity. It is known that metabolic imbalances caused by soil salinity include direct ion toxicity, osmotic stress, nutritional deficiency and oxidative stress. Buckwheat as one of important alternative crops with the huge developmental potential is classified as a salt-sensitive glycophyte plant. Revealing of salt tolerance as well a salt sensitivity mechanisms would be useful for development of salt resistant varieties for important cultures and solve the worldwide problem of food security. Therefore the aim of presented work was identify molecular-biochemical changes of buckwheat plants on the cations and polar metabolites levels under NaCl impact.

Plants F. esculenthum (var.Ukrainka) were grown in the greenhouse as a sand culture with addition of ½ Hoagland-Arnone nutrient solution. After ten days (period were biomass accumulated) plants were exposed to the 100 mM of NaCl. The control variant was without NaCl. The plant material was analyzed on the 48th and 72nd hours (salt shock) and on the 7th day (salt stress) of salt influence. Identifying and quantifying polar metabolites was performed using GC- MS method, cationic contend – by ion-exchange chromatography.

Salt treatment caused cation imbalance in plant tissues. After 48 hours of salt exposure the level of sodium ions increased by 7-10 times to approximately the same level in the roots, stems and leaves of experimental plants. These changes were accompanied by decrement of the K+/Na+ ratio, especially in the roots and increase the content of NH^{4+} ions in the stems. For the 72th hour the K^+/Na^+ ratio decreased to its minimum level and on the 7th day of salt stress it recovered closely to the control level. Soluble Ca^{2+} content increased on the 72 hour of salt exposure in roots, stems and leaves; for the 7th day it remained high in the roots, and decreased in the rest parts of buckwheat plants. To the 7th day of the experiment the level of sodium ions exceeded control 3-times in roots and 4-times in above ground parts, which confirms the absence of transport barriers on the movement of sodium ions from roots towards shoots of F. esculenthum and explains a salt sensitivity of this crop.

On the 48th hour of the salt influence the decrease only of tree free amino acids (AA) levels - alanine, glutamic acid and serine was noticed, whereas the contents of the rest analyzed AA, e.g. asparagine, cysteine, glycine, isoleucine, leucine, methionine, ornithine, proline, tryptophan, tyrozine, valine increased. More than 150% increment to control was revealed for the organic acids such as fumaric acid, 2-Oxoglutaric acid, gluconic acid, oxaloacetate and threonic acid, sharp decrement observed for the succinic acid. Sugars levels changed towards decrement of glucose and galactose.

Increased intermediate amino acid levels indicate a decrease of sink capacity (e.g. protein synthesis) due to the stress. The increase of the „compatible solutes" sucrose, pinitol, threitol, the double amount of the antioxidant ascorbic acid and also the increase of calcium uptake might be seen as evidence of a basic avoidance mechanism at work,. Albeit, it seems not enough for F. esculentum to cope with such a high salinity, but might prove sufficient at lower salinity levels.

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Гришко В.

ОЦІНКА ЕФЕКТИВНОСТІ ФУНКЦІОНУВАННЯ БАР'ЄРНИХ МЕХАНІЗМІВ НАДХОДЖЕННЯ ВАЖКИХ МЕТАЛІВ ДО ВЕГЕТАТИВНИХ ОРГАНІВ СИНАНТРОПНИХ ТРАВ'ЯНИСТИХ РОСЛИН

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Gryshko V. EVALUATION OF EFFICIENCY OF FUNCTIONING OF BARRIER MECHANISMS OF HEAVY METAL INJECTION TO VEGETATIVE ORGANS OF SINANTHROPIC HERBAL PLANTS. The study of the accumulation of metals in the root tissues of synanthropic plants showed that these species belong to the microconcentrators Zn, Cd, Pb. These species are also macroconcentrators Fe and deconcentrators Cu. High efficiency of the functioning of the barrier mechanisms of entry into the leaves of Zn, Ni, Cu is established for *Achillea submillefolium* L., *Galium mollugo* L*., Elytrigia repens* (L.) *Desv. Ex Nevski*, *Artemisia absinthium* L., and Pb - in *A. absinthium*. In other cases, the translocation of heavy metals to the terrestrial organs of the synanthropic species was carried out in a substantially barrier-free manner.