

THE INFLUENCE OF THE DRUG EPIN-EXTRA ON THE MITOTIC ACTIVITY OF ROOT MERISTEM CELLS OF CORN ON THE BACKGROUND OF THE ACTION OF COPPER SULPHATE

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Disturbance of growth is one of the visible symptoms of the effects of various stress factors. Most of the substances entering the plant, is absorbed by the root system, so at the root of the observed primary reaction to their impact. Such exposure leads to impaired functioning of the cells. Therefore, the aim of our research was to study the influence of the drug Epin-ekstra on growth rates of roots and mitotic activity of apical meristem cells of germinating corn seeds *Zea mays* L. CV / Claudio / on the background of the action of copper sulphate. The drug Epin-ekstra is an anti- stress adaptogen that has the ability to neutralize the harmful effects of pesticides, salts of heavy metals, radionuclides and nitrates/

The objects of study were used seeds and seedlings of corn, *Zea mays* L., CV /Claudio /. The study was performed in the laboratory. Presowing treatment of seeds was carried out in 0,075 % solution of the drug Epin-ekstra. Control some of the seeds were soaked in settled tap water. As a source of copper ions using a copper sulphate (h. d. a.). Treated seeds for germination were placed in cuvettes on a filter paper and was poured 250 ml of the copper sulfate solution of different concentrations (from 25mm to 100mm). As a control, seeds germinated on water supply pooled water and on solutions of copper sulphate the same concentrations. Seeds germinated in a thermostat TC-80M-2 in the dark at a temperature of +25 ° C according to GOST 12038 – 84. To determine the mitotic activity of cells of root meristem of shoots of corn, the material was fixed in acetic alcohol (3:1) overnight at +10 °C. Fixed material was washed in 96 % alcohol and preserved in 70 % ethanol in the fridge. For cytological studies the color of the roots was acetocarmine for 48 hours. Temporary squash preparations of root tips of maize seedlings was prepared by standard methods the experiment was carried out in triplicates by analyzing at least 1000 cells. Calculation of mitotic and phase indexes were produced according to standard formulas. Statistical data processing was carried out, calculating the arithmetic mean and standard error of the arithmetic average.

In the result of the study it was found that presowing treatment of seeds of 0.075 % solution of the drug Epin-ekstra leads to an increase in mitotic index by 34 % in the variant with maximal concentrations (100 mm) of copper sulphate. The germination of corn seeds in the environment of the pollutant contributed to the decline in mitotic index, formation of protezno – metaphase block, reducing the number of cells in anaphase and

telophase. Under the action of the drug is a redistribution of the number of cells in the direction anaphase – telephase unit. Thus, the drug Epin-ekstra stimulates the mitotic activity of apical meristem cells of maize roots under different concentrations of copper sulfate with further intensification of the processes of root growth and improving absorption capacity.

Keywords: corn, Epin-extra, mitotic index, cell division, copper sulfate.

References

1. Bashmakov D. I., Lukatkin A. S., *Ecological and physiological aspects of accumulation and distribution of heavy metals in higher plants*, 236 (Mordovia University Publishing House, Saransk, 2009).
2. Seregin I. V., Ivanov V. B., Physiological aspects of cadmium and lead toxic effects of on higher plants, *Physiology of Plants*, **48**, 606 (2001).
3. Meharg A. A. Mechanisms of plants, resistance to metal and metalloid ions and potential biotechnological applications. *Plant Soil*, **274**, 163 (2005).
4. Clemens S. Toxic metal accumulation, responses to exposure and mechanisms of tolerance in plants. *Biochimie*, **88**, 1707 (2006).
5. Evseeva T. I., Regularities in the induction of cytogenetic effects in plants under the action of heavy metals, *Bulletin of the Institute of Biology of the Komi Science Center, Uro RAS*, **87**, **1**, 4 (2005).
6. Ivanov V. B., Comparison of the influence of heavy metals on root growth in connection with the problem of specificity and selectivity of their action, *Physiology of Plants*, **50**, 445 (2003).
7. Clemens S. Molecular mechanisms of plant tolerance and homeostasis. *Planta*, **212**, 475 (2001).
8. Dovgalyuk L. I., Assessment of phyto- and cytotoxic activity of compounds of heavy metals and aluminum using root apical meristem of onions, *Cytology and Genetics*, **35**, **1**, 3 (2001).
9. Dovgalyuk L. I., Cytogenetic effects of toxic metals salts on apical meristem cells of *Allium cepa* L. seeding roots, *Cytology and Genetics*, **35**, **2**, 3 (2001).
10. Kozhevnikova A. D., Seregin I. V., Influence of lead, nickel and strontium nitrates on the division and extension of corn root cells, *Physiology of plants*, **56**, 268 (2009).
11. Hall J. L. Cellular Mechanisms for Heavy Metal Detoxification and Tolerance, *J. Exp. Bot.*, **53**, 1 (2002).
12. Reshetnik G. V., Leonov M. P., Chmeleva S. I., Influence of the Epin-extra preparation on the germination of corn seeds against the background of copper sulfate action, *Proceedings of the VII International Scientific and Practical Conference "Biotechnology as a tool for conserving the biodiversity of the plant world (physiological -biochemical, embryological, genetic and legal aspects)* (Yalta, the Republic of Crimea, 2016), 290.
13. *Polyfunctionality of the brassinosteroids action*, Collection of scientific papers, 360 ("NEST M", Moscow, 2007).
14. State standard GOST 12038–84. Seeds of agricultural crops. Methods for determining germination (with Changes No 1, 2), Requirements, introduced 1986-06-30, 29 p. (Interstate Standard Publishing House of Standards, Moscow, 2011).
15. Sobchuk N. A., Chmeleva S. I., Effect of presowing treatment with zircon preparation on the mitotic activity of the apical meristem of corn roots, *Scientific Notes of V.I. Vernadsky Crimean Federal University. "Biology, Chemistry" Series*, **1** (**67**), **1**, 107 (2015).
16. Prokhorova I. M., Kovaleva M. I., Fomicheva A. N., *Evaluation of the mitotic and mutagenic action of the environment*, 32 (Yaroslavl State University Publishing House, Yaroslavl, 2003).
17. Protasov K. V., *Statistical analysis of experimental data*, 232 (Mir Publishing House, Moscow, 2005).
18. Masia D., *Mitosis and the physiology of cell division*, 427 (IL Publishing House, Moscow, 1963).
19. Katashov D. A., Khryanin V. N., Influence of phytohormones and sodium selenium on the mitotic activity of apical meristems of the roots of rape seedlings (*Brassica napus*), *Proceedings of Higher Educational Establishments. The Volga region. Natural Sciences*, **2** (**2**), 49 (2013).
20. Kalinich J. F., Mandava N. B., Todhunter J. A. Relationship of nucleic acid metabolism to brassinolideinduced responses in beans, *J. Plant Physiol.*, **120**, **3**, 207 (1985).