

ACTION OF THE PREPARATION ZIRCON ON THE GROWTH AND DEVELOPMENT OF PLANTS OF CORN UNDER THE OSMOTIC STRESS

Sobchuk N. A., Chmeleva S. I.

*V.I. Vernadsky Crimean Federal University, Simferopol, Crimea, Russian Federation
E-mail: sob4uk.n@gmail.com*

In agriculture growth regulators are used to improve the salt tolerance of crop plants. Their influence is aimed at increasing crop and increase plant resistance to extreme environmental conditions, and in particular to soil salinity. The preparation Zircon is a growth regulator of new generation. It increases the root formation, growth processes, the duration of flowering and resistance to diseases, increases the crop yields and quality of plants. The effect of this preparation on the maize plants under osmotic stress today is not enough studied, so the aim of the work was to study the action of the preparation Zircon on the growth and development of corn plants in the early stages of development in the conditions of osmotic stress.

The object of research is the seeds and plants of corn *Zea mays* L., CV / TAR 349 MV. The corn seeds of medium size etched in a weak solution of potassium permanganate. Then to each cuvette on the filter paper laid 50 seeds. Osmotic stress was modeled by the addition in cuvettes 300 ml solution with a various concentrations NaCl (50 mM, 100 mM, 150 mM, 200 mM, control №1 - distilled water). To investigate the action of the preparation Zircon on the growth and development of plants of corn under the osmotic stress were using above mentioned concentrations of NaCl with 0.05% growth regulator (control №2 – Zircon 0.05 %). The seeds are germinated in a thermostat TS-80M-2 in the dark at +25 ° C. On day 4 seedlings of plants were transferred to a 0.5-liter vessels on the water culture (solution of Knop). In 11-day-old plants were established value of morphometric parameters (plant height, roots length, the mass of raw substance, area of leaf surfaces) by conventional methods in plant physiology. Statistical processing of obtained data was performed by calculating arithmetic mean and standard error of arithmetic mean. In order to determine significant differences of distribution of biometric data the Student's t-test was used.

On the basis of conducted studies, we reached the following conclusions:

1. Is noted the significantly different ($p < 0,05-0,001$) stimulating and anti-stress the action of the preparation Zircon on the growth and development of plants of corn under the simulated osmotic stress.

2. Is shown the stimulating effect of growth regulator in a concentration of 0.05 % on the growth performance of 11-day-old plants of corn (plant height has increased on 10,6–36,3 %; length of roots – on 7,8–68,7 %; mass of raw substance of the aboveground part - to 12–50,4 %; mass of raw substance of the underground part – on 21–106,5 %; area of leaf surfaces – on 18,5–130 % compared with variants of saline solutions and control №1) in simulated conditions of osmotic stress.

3. Preliminary steeping of the seeds in a solution of studied synthetic regulator of growth with a concentration of 0.05 % increases the salt tolerance of plants *Zea mays* L.,

CV / TAR 349 MV, which in turn will improve the quality of the plants and will effect on their productivity.

Keywords: corn, Zircon, morphometric parameters, osmotic stress, salt tolerance.

References

1. *Rasteniyevodstvo: Kratkij kurs lekcij dlya aspirantov napravleniya podgotovki 35.06.01 Sel'skoe hozjajstvo* [Plant growing: A short course of lectures for graduate students training direction 35.06.01 Agriculture], 100 p. (Saratov, 2014)
2. Baliev A. Soil degradation threatens agriculture of Russia, *Agrarnoe obozrenie* [Agricultural Review], 2009. Available at: <http://agroobzor.ru/zem/a-136.html> (Accessed 12 October 2009).
3. Gorshkov S. P. *Konceptual'nye osnovy geoehkologii: Uchebnoe posobie* [Conceptual bases of geocology: Textbook], 288 p. (Smolensk, Publishing House of the Smolensk Humanitarian University, 1998).
4. Fellenberg G. *Zagryaznenie prirodnoj sredy. Vvedenie v ehkologicheskuyu himiyu* [The pollution of environment. Introduction to environmental chemistry], 232 p. (Moscow, Mir Publ., 1998).
5. Prusakova L. D., Malevannaya N. N., Belopukhov S. L., Vakulenko V. V. Plant growth regulators with antistress and immunoprotecting properties. *Agrochemicals*, **11**, 76 (2005).
6. Chmeleva S. I., Kucher E. N., Dashkevich Y. O., Sitnik N. I., The influence of drug Zircon on the growth and development of corn plants at the early stages of ontogenesis, *Scientific Notes of Taurida National V. I. Vernadsky University, Series: Biology, Chemistry*, **26 (65), 4**, 188 (2013).
7. Chmeleva S. I., Kucher E. N., Dashkevich Y. O., Sitnik M. I. The influence of drug Zircon on the growth and development of corn plants at the early stages of ontogeny in conditions of drought, *Scientific Notes of Taurida National V. I. Vernadsky University, Series: Biology, Chemistry*, **27 (66), 1**, 223. (2014).
8. Shevelukha V. S., Kovalev V. M., Gruzdev L. G., Plant growth regulators in agriculture, *Vestnik s.-h. nauki* [Herald of agricultural science], **9**, 57 (1985).
9. Buhara A. M., Kabuzenko S. N., Omelchenko A. V., Effect of drug «Geoplus» on Stability to salification and drought of corn in the early stages of ontogeny, *Scientific Notes of Taurida National V. I. Vernadsky University. Series: Biology, Chemistry*, **19 (58), 1**, 3 (2006).
10. Sobchuk N. A., Chmeleva S. I. Influence of preseedling processing by the preparation Zircon on mitotic activity apical meristems of roots of corn, *Scientific Notes of Crimean Federal V. I. Vernadsky University. Biology, Chemistry*, **1 (67), 1**, 107 (2015).
11. Malevannaya N. N., The explosive temperament of zircon in the service of plant, *Novyj sadovod i fermer* [The new gardener and farmer], **1**, 45 (2001).
12. Malevannaya N. N., Drug zircon - a new type of immunomodulator, *Nauchno-prakticheskaya konferenciya «Primenenie preparata cirkon v proizvodstve sel'skohozyajstvennoj produkcii»* [Abstracts of Scientific and Practical Conference "Use of the drug zircon in agricultural production"], pp. 17-20. (Moscow, 2004).
13. Malevannaya N. N., Growth stimulating and immunomodulatory activity of natural complex hydroxycinnamic acids (drug Zircon), *IV Mezhdunarodnaya nauchnaya konferenciya «Regulyaciya rosta, razvitiya i produktivnosti rastenij»* [Abstracts of IV International Scientific Conference "Regulation of growth, development and productivity of plants"], pp. 141. (Minsk, 2005).
14. Tkachuk O. A., Pavlikova E. V., Orlov A. N., Efficiency of growth regulators in the cultivation of spring wheat in the forest-steppe zone of the Middle Volga, *Molodoy uchenyj* [Young scientist], **4**, 677. (2013).
15. Grodzinskiy A. M., Grodzinskiy D. M. *Kratkij spravochnik po fiziologii rastenij* [Quick reference to Plant Physiology], 591 p. (Kiev, Naukova Dumka Publ., 1973).
16. Tretyakov N. N., Karnauhova T.V., Panichkin L. A. *Praktikum po fiziologii rastenij* [Practical work on Plant Physiology], 271 p. (Moscow, Agropromizdat Publ., 1990).
17. Protasov K. V., *Statisticheskij analiz ehksperimental'nyh dannyh* [The statistical analysis of experimental data], 232 p. (Moscow, Mir Publ., 2005).