EFFICIENCY OF REGLALG IN INCREASING MAIZE TOLERANCE TO SUPEROPTIMAL TEMPERATURES

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Maize (Zea mays L.) a strategic cereal crop, ranks third in the world in terms of sown area, after wheat and rice. Maize products are utilized in a range of branches, including feed, food and processing industry, medicine etc. In recent years, humanity has been facing the effects of climate change on the planet and the unpredictable climatological anomalies related to it. Among extreme climatic factors, the thermal stresses conditions had a serious impact on the growth, development and productivity of maize. NASA study results show that climate change could affect corn production as early as 2030, which is expected to fall by 24% [1]. In this regard, the use of various methods to increase plant resistance to heat stress is one of the most important tasks for both agriculture and scientific researches. One of the ways that are widespread in terms of increasing resistance to stress factors is the preliminary processing of seeds with natural growth regulators, to activate the initial stages of germination, growth rate and formation of a powerful root system that could subsequently affect favorably the whole course of plants ontogenesis.

The purpose of the study consisted in studying the influence of preliminary processing maize seeds with bioregulator Reglalg on germination and growth parameters of seedlings, depending on the action of high temperatures.

Keywords: seeds, maize, hybrids, Reglalg, heat stress, growth parameters

Materials and Method. In the studies were used seeds of different maize hybrids that differ after their resistance to high and cold temperatures, with average thermotolerance, which after the action of the high temperature, germinates more than 50%. Experiments were performed under laboratory-controlled conditions at 25°C, in the dark and air humidity of 60-70%. The seeds of the maize hybrid sensitive to high temperatures, Por. 427 were treated with H2O (control) or Reglalg (experimental) and then were exposed to the action of various high temperatures (HT). The working concentration of the Reglalg preparation used for the processing of maize seeds was established experimentally as a result of several laboratory experiments, followed by the determination of the germination percentage and the morpho-physiological parameters of the seedlings.
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Seedlings of all experiments were collected after 5 days for biometric assessments, including measurement of epicotyls height, radicle length, and their fresh biomass. The results were statistically analyzed using the “Statistics 7” software package for computers. The obtained results are means of 3 measurements of samples resulting from 3 different experiments.

**Results.** Preliminary experiments under laboratory-controlled conditions at 25°C with utilization of seeds of Por. 427, sensitive to high temperature (HT), which were exposed to the action of various high temperature the thermotolerance degree of this hybrid was established. Also, for seeds this hybrid the concentrations of Reglalg preparation, having the best effect on germination and growth parameters were demonstrated. Obtained results on the influence of HT on the germination and growth of the maize hybrid seedlings (Por. 427) sensitive to HT showed, that with the increase in the values of high temperatures, the % of seed germination on 1st day decreases, being 86.7% in the control, and 78, 56, 36 and 1.6%, respectively, in the variants with HT of 44, 47, 50 and 53°C, respectively. On the next, 2nd, 3rd and 4th days, the germination rate gradually increases, amounting to 98% in the control, and 96, 90, 81 and 71% at HT of 44, 47, 50 and 53°C, respectively. Testing the effect of high temperature of 50°C for 30 minutes on the germination and growth of seedlings of various maize hybrids (Por. 180, Bemo 203, Por. 374 and Por. 427), which differ in resistance to high temperatures and cold, causes a decrease in both % seed germination, and % germination energy in all hybrids studied. For the hybrid with increased resistance to high temperatures (Por. 374), according to the authors of obtaining these hybrids, we observed the lowest germination %, compared to the other hybrids. But biometric determinations showed that HT of 50°C for 30 min does not affect the length of the radicle and epicotyl of the Por 374 hybrid. At the same time, HT causes a decrease in the growth of radicles and epicotyls by 1.1 and, respectively, 1.4 times in the hybrid Por. 427, sensitive to high temperatures. HT also affects the biometric indices of maize hybrids with different cold resistance – Por. 180 and Bemo 203. The level of inhibition of radicle and epicotyl growth is higher in the cold sensitive hybrid - Bemo 203, being by 1.4 and 1.6 times higher, respectively, compared to the control.

Analysis of the effect of seed pre-treatment of maize hybrids differing in their resistance to HT (Por. 374 and Por. 427) with the optimal dose (1/200) of Reglalg on seed germination and growth parameters under the influence of super-optimal temperature of 50°C with the duration of 30 min showed that HT reduces the percentage of seed germination in both hybrids studied, as well as in the controls (53% - Por. 374; 75% - Por. 427), as well as in the variants with the application of Reglalg (62% - Por. 374; 87% - Por. 427). As demonstrate the data obtained the percentage of germination in the variants with Reglalg and HT is higher than in the controls.

The results obtained with the use of Reglalg for seed treatment of resistant (Por.374) and sensitive (Por.427) maize hybrids to HT before their subjection to super-optimal
temperature of 50°C for 30 minutes showed a positive effect of the preparation in increasing growth rates of seedlings, including the length of radicles, eight epicotyls and their fresh biomass, compared with the controls. The maximum length of both radicles and coleoptiles was obtained for seedlings of maize hybrid resistant to HT (Por.374), grown from seeds pretreated with Reglalg preparation and application of 50°C temperature. With these treatments, the length of the radicles was significantly longer - by 14%, and epicotyls - by 12%, compared with the controls.

**Conclusions.**
- Laboratory experiments with the application of the preparation Reglalg for the treatment of seeds of various maize hybrids before exposure to the action of high temperatures have shown that Reglalg exerted a beneficial action on the physiological state of maize seedlings in the juvenile stage of ontogenesis, increasing germination rate and morpho-physiological parameters.
- The results obtained regarding the germination percentage, root length, epicotyl height and their fresh biomass are informative indicators reflecting the effectiveness of the use of Reglalg in seed pretreatment, which increases the maize resistance under the action of super optimal temperatures.
- Reglalg preparation can be used as a plant growth stimulator for seed germination and seedling development during early stages of ontogenesis under high temperature action.

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