

## EFFICIENCY OF BIOREGULATORS AGAINST POWDERY MILDEW DISEASE (*LEVEILLULIA TAURICA* (LEV.)G. ARNAUD.) SPREAD ON TOMATO PLANTS

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The given article presents the results of studying the way the bioregulators (Albit, Zircon and Epin-extra) influence powdery mildew disease, caused by pathogenic fungus *Leveillulia taurica* (anamorph *Oidiopsis sicula*) and spread on tomato. The adaptogenic activity has also been studied, including its influence on tomato resistance to water deficiency and higher temperature during vegetative stage. The plant growth bioregulators Albit, Zircon and Epin-extra have antistress and protection effect, therefore, the research shows that use of these bioregulators results in considerable reducing powdery mildew disease on tomato and in increasing resistance of plants to unfavorable environment conditions.

**Keywords:** tomato, powdery mildew, plant growth regulators, plant water conditions, photosynthetic potential, actual photosynthesis productivity

Bioregulators are natural, highly effective preparations stimulating plant growing and protecting plants from injurious influence of abiotic and biotic environment factors. Use of growth regulators in small doses helps to decrease harmful influence on living organisms. The rational application of bioregulators leads to considerable reduction of chemical weed and pest killers, and that is definitely improving environmental and ecological conditions and safety of the production. The purpose of the present research is to study the way and the efficiency the bioregulators influence powdery mildew disease, caused by pathogenic fungus *Leveillulia taurica* (anamorph *Oidiopsis sicula*) on tomato plants and their resistance to harmful environment conditions.

### Material and methods of research

Bioregulators Albit, Zircon and Epin-extra have been tested on a tomato variety *Novitchok Rozoviy* cultivated with a recommended dose of fertilizers when planting out. These bioregulators have antistress and protection characteristics, they stimulate vital activity of tomato plants.

Concentrations of bioregulators solutions have been tested on vegetable crops according to the description enclosed. Solutions of Albit (2 ml per 1 litre of water), Zircon and Epin-extra (2 drops per 100 ml of water) have been applied to preplant processing of tomato seeds. Testing tomato seeds have been soaked in distilled water. The time of soaking of all kinds (has) made up 6 hours.

Plant spraying during vegetation period was carried out using solutions of Albid (1 ml/10 litres of water; during initial phase and during flowering), Zircon (0,1 ml/1 litre of water; after planting out and during 1<sup>st</sup>, 3<sup>d</sup> and 4<sup>th</sup> cluster flowering, Epin-Extra (5-6 drops/0,5 l of water during initial phase and before panting; and 1 ml/5 litres of water when budding and at the beginning of flowering). Control plants were processed with distilled water. Field testing were carried out in 4 replications according to «Methods of carrying out tests and experiments». During research the following observations have been carried out: phonological observations

on growth and development phases of plants, biometric measuring; physiological observations: measurements of photosynthetic activity of crops and plant water conditions. Accounting of tomato disease spread and accounting of crop capacity have been made according to the methods of Russian Scientific Research Institute of Plant Growing. Statistic analysis of crop capacity data has been carried out by variants.

### Results of research and their discussion

The symptoms of mildew powdery disease were observed on tomato variety *Novitchok Rozoviy* during flowering and fruiting period. Higher air temperature (27-30 °C) aggravated the disease. Plants had lower turgor, assimilatory leaf surface decreased due to powdery mildew, and that resulted in decreasing tomato crop to 30,7 t/h during control.

Study of powdery mildew progress showed that the disease reached its peak during fruiting period (Table 1).

**Table 1**  
Influence of growth regulators on powdery mildew disease spread on tomato plants

Treatments	% damaged plants	Preparation biological efficiency %
I – Control	30,6	-
II – Albit	10,0	67
III – Zircon	14,1	54
IV – Epin-Extra	12,2	60

The test carried out with Albit processing indicated the least number of damaged plants and, therefore, the best result; bioregulator Albit strengthens plant immunity to diseases. Plants with powdery mildew disease made up 30,6% during control. Thus, use of bioregulator Albit made it possible to increase resist-

ance of plants to the disease, reducing the number of diseased plants to 20,6% in comparison with control. Biological efficiency of Albit made up 67%. Bioregulator Epin-extra – 60% with biofungicide properties showed high biological efficiency against mildew powdery disease on tomato variety *Novitchok Rozoviy*. The amount of damaged plants made up 12,2% – that is 18,4% less as compared with control. The application of immunomodulator Zircon on tomato plants has also proved to be effective, Zircon reduced the amount of diseased plants to 16,5% in comparison with control, as Zircon has powerful fungicide and antistress effect. Its biological efficiency made up 54%.

Disease spreading is mostly provoked by harmful environmental conditions in which plants grow and develop. Higher temperature in spring and summer period and water deficiency in the Astrakhan region are the main limiting factors of environmental conditions which have negative effect on agricultural crops planting and growing and their productivity. Therefore, plants are in harmful conditions during all vegetative stage, and this has a negative influence on their resistance to diseases, crop capacity and production quality. Therefore, we have studied the influence of bioregulators on plant water conditions and photosynthesis productivity of tomato crops during vegetative stage (Table 2). It is proved that the bioregulators applied are adaptogens increasing drought and heat resistance of plants and reducing water deficiency in tomato plants during vegetative stage in drought conditions (Table 2). The maximum indicator of tomato plant water deficiency was observed at midday during flowering and fruiting period.

**Table 2**

Influence of bioregulators on water conditions and photosynthesis productivity of tomato plants

Treatments	Water deficiency, %	Photosynthesis Productivity, mln m <sup>2</sup> /hectares
I – Control	15,2-28,4	3,5
II – Albit	11,8-18,2	4,7
III – Zircon	13,3-20,1	4,0
IV – Epin-Extra	12,0-19,6	4,3

Growth regulator Albit helps to increase turgor and to strengthen water-retaining ability of plant leaves; due to this water deficiency during vegetative stage was 3,4–10,2% less compared with control plants, water amount in leaves also increased from flowering phase till absolute ripeness by 61,9–81,5 g per 100 g dry weight of leaves. Growth regulator Epin-Extra influences the synthesis of antistress proteins and helps to reduce water deficiency coefficient to 3,2–8,8% and, as a result, to increase water amount in leaves to 43,5–62,2 g per 100 g dry weight of leaves as compared with control. The application of Zircon helped to decrease water deficiency of tomato plants to 1,9–8,3% as compared with control and to increase water amount of leaf tissue to 42,7–53,3 per 100 g dry weight of leaves in comparison with control – and this confirms the ability of the regulator to reduce transpiration in conditions of higher temperature and water deficiency, increasing drought resistance. Photosynthetic activity of plants depends on water conditions. The bioregulators increase stress resistance of tomato plants in drought conditions, so, the bioregulators influence better absorption (use) of light energy by plants, increasing photosynthesis productivity of crops.

The application of Albit showed the best photosynthesis productivity and made up 1,2 mln m<sup>2</sup> days per hectare higher as compared with control. Bioregulators Zircon and Epin-Extra raised photosynthesis productivity of *Novitchok Rozoviy*, increasing surface of leaves and total biomass (Zircon) and increasing chlorophyll amount in leaves (Epin-Extra) as compared with control to 0,5 and 0,8 mln·m<sup>2</sup> days per hectare. Actual photosynthesis productivity raised with use of all treatments and correlated with photosynthesis potential ( $r = 0,97$ ).

### Conclusion

Plant growth regulators have antistress and protection effect, therefore, use of these regulators in tomato planting technology helps to reduce powdery mildew disease in considerably and also to increase resistance of tomato plants to harmful environment conditions. The applied bioregulators increased resistance of tomato plants to higher temperatures and water deficiency during vegetative stage. The presence of adaptogen and protection effects of bioregulators may be the base for development of promising and ecologically safe means of biological protection of tomato plants and reduction of stressful pressure on plants when forming rich crops with good quality of production.

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