

- [и др.] // Вестник Российского университета дружбы народов. Серия: Агрономия и животноводство. – 2012. – № 3. – С. 12–20.
8. Малеванная Н. Н. Препарат циркон – иммуномодулятор нового типа / Н. Н. Малеванная // Научно-практическая конференция «Применение препарата циркон в производстве сельскохозяйственной продукции». – М., 2004. – С. 17–20.
  9. Малеванная Н. Н. Циркон – новый стимулятор роста и развития растений / Н. Н. Малеванная // VI Международная конференция «Регуляторы роста и развития растений в биотехнологиях». – М., 2001. – С. 163–171.
  10. Государственный стандарт Союза ССР. Семена сельскохозяйственных культур. Методы определения всхожести семян. ГОСТ 12038-84. – М., 1985. – 56 с.
  11. Третьяков Н. Н. Практикум по физиологии растений / Н. Н. Третьяков, Т. В. Карнаухова, Л. А. Паничкин – М.: Агропромиздат, 1990. – 271 с.
  12. Протасов К. В. Статистический анализ экспериментальных данных. / Протасов К. В. – М.: Мир. 2005. – 232 с.
  13. Ничипорович А. А. О путях повышения продуктивности фотосинтеза растений в посевах. Фотосинтез и вопросы продуктивности растений / А. А. Ничипорович. – М.: Изд-во АН СССР, 1963. – С. 5–36.
  14. Кузнецов В. В. Физиология растений / В. В. Кузнецов, Г. А. Дмитриева. – М.: Высшая школа, 2005. – 736 с.

## STUDY OF THE DYNAMICS OF GROWTH AND ACCUMULATION OF DRY SUBSTANCE *PISUM SATIVUM* L. UNDER THE ACTION OF DRUG ZIRCON

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Leguminous crops are of great economic importance as a source of vegetable protein. However, despite the great value of these cultures, until recently they have not been properly distributed on the territory of the Republic of Crimea. The acreage of this crop in the Crimea in 2016 was only about 4.1 % of all cultivated crops.

Due to the fact that *Pisum Sativum* L. is rather demanding for the water regime, its yield is largely dependent on the conditions of water supply. In the conditions of the blocked North Crimean canal in the Republic of Crimea, only 17 thousand hectares were left out of 140 thousand hectares of irrigated land in 2014, watered from local sources.

One of the ways to increase the resistance of plants to various unfavorable environmental factors, including drought, is the use of synthetic physiologically active substances with a large range of physiological effects on the plant, which do not adversely affect the soil and the environment.

The purpose of our work was to study the effect of the Zircon growth regulator on the dynamics of growth and the accumulation of dry substance *Pisum Sativum* L.

As objects of research, pea plants of the cultivar Arpha (*Pisum Sativum* L CV / Arpha /) were used. The seeds' samples, taken in medium size and etched in a weak solution of potassium permanganate, were soaked in aqueous solutions of Zircon (0,05 %, 0,125 %, 0,25 %, 0,5 %) for 4 hours, and then placed in a thermostat TC-80-M-2 for germination in the dark at + 25 °C according to the requirements of national standard GOST 12038-84.

For comparison we used seeds soaked in tap water. Sprouted seeds were planted in 0.5-liter glass vessels filled with Knop nutrient solution. In order to study the effect of Zircon on the growth and accumulation of dry substance, plants were grown in aquatic culture under natural light and at a temperature of +22 to +24°C for 21 days. In the 4-, 8-, 14- and 21-day plants, the morphometric parameters (plant height, root length, weight of raw and dry substance, leaf area) were established according to the methods generally accepted in plant physiology.

Analysis of the data obtained showed that presowing treatment with a growth regulator had a positive effect on growth processes and the accumulation of dry substance of *Pisum Sativum* L., while the stimulating growth processes of the Zircon drug persisted throughout the growing season.

It was found that the greatest positive effect of the growth regulator was manifested when a solution with a concentration of 0.125 % was used for presowing soaking. The sprout height of the experimental plants in this variant exceeded the control ones by average of 141.3 – 148.5 %. The length of the main root of 21-day-old plants in the variant using the optimal concentration of the growth regulator was 34.2 % higher than the control variant, the number of lateral roots was 26.1%, the leaf area – 15.1 %, the mass of the raw substance was 20.3 % – 24.5 %, weight of dry substance – by 27.3 – 33.0 %.

On the basis of our studies, we can recommend the use of Zircon for presowing seed treatment of *Pisum Sativum* L. Pre-soaking seeds in solutions of the growth regulator in question will help increase their sowing qualities, and also contribute to the formation of seedlings with a higher development potential than control plants.

**Keywords:** edible pea (*Pisum Sativum* L.), Zircon, growth processes, mass of dry substance.

#### References

1. Smyslov D. G. Agroecological substantiation of methods for increasing the productivity of tomatoes in southern chernozems of the Saratov region, Abstract of Abstract of thesis candidate of biol. sci., 21. (Saratov, 2008).
2. Seregina I. I. Influence of Zircon on improving wheat resistance to salts of heavy metals, *Abstracts of scientific-practical conference. "The use of the drug Zircon in agriculture"*, 9. (Moscow, 2004),
3. Chmeleva S. I., Kucher E. N., Dashkevich Yu. O. and Sitnik M. I., Effect of the drug Zircon on growth and development of corn plants in the early stages of ontogenesis in conditions of drought, *Scientific Notes of Taurida National V. I. Vernadsky University, Series: Biology, Chemistry*, **27 (66)**, **1**, 223 (2014).
4. Deeva V. A., Sheleg Z. I. and Sanko N. V., *Selective action of chemical growth regulators*, 255 (Science and Technology, Minsk, 1988).
5. Chmeleva S. I., Kucher E. N., Stimulating effect of Zircon preparation on germination of pea seeds, *Scientific Notes of Taurida National V. I. Vernadsky University, Series: Biology, Chemistry*, **67**, **1**, 174 (2015).
6. Vakulenko V. V., Shapoval O. A., Plant growth regulators, *Library on Plant Protection. Appendix to the journal "Plant Protection and Quarantine"*, **12**, 48 (2008).
7. Efimova M. V., Khasan D. A. K., Kholodova V. P. et al., Influence of brassinosteroids on seed germination and rape growth in the initial stages of ontogenesis in chloride salinization, *Vestnik Peoples' Friendship University of Russia. Series: Agronomy and animal husbandry*, **3**, 12 (2012).
8. Malevannaya N. N., Drug Zircon – a new type of immune modulator, *Abstracts of scientific-practical conference "The use of Zircon product in the production of agricultural products"*, 17 (Moscow, 2004).

9. Malevannaya N. N., Zircon – a new stimulator of growth and development of plants, *Abstracts of V. I. International Conference "Growth regulators and plant development in biotechnology"*, 163 (Moscow, 2001).
10. State Standard of the USSR. Seeds of agricultural crops. Methods for determining the germination of seeds. GOST 12038-84, 56. (Moscow, 1985).
11. Tretyakov N. N., Karnaukhova T. V., Panichkin L. A., *Workshop on Plant Physiology*, 271 (Agropromizdat, Moscow, 1990).
12. Protasov K. V., *Statistical analysis of experimental data*, 232 (Mir, Moscow, 2005).
13. Nichiporovich A. A., *On ways of increasing of efficiency of photosynthesis of plants in sowing. Photosynthesis and issues of plant productivity*, 5 (Academy of Sciences of the USSR Publishing, Moscow, 1963).
14. Kuznetsov V. V., Dmitrieva G. A., *Plant Physiology*, 736 (Higher School, Moscow, 2005).