



Effectiveness of Stimulating Biopreparations in Tomato Growing in the Aral Sea Region

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Abstract

The article presents information on determining the effectiveness of using the Zamin M biopreparation based on local rhizobacteria in the cultivation of tomato plants in the conditions of saline soils of the Aral region. According to the results of the research, it was found that the average weight of the fruit in the TMK-22 variety compared to the standard increased by 9.3 grams and in the Volgograd 5/95 variety by 19.8 grams under the influence of the preparation.

Keywords: Complex Biopreparations; Rhizobacteria; Osmoprotector; Tomato; Substrate Carrier; Salinity; Soil Degradation; Marketability; Productivity

Introduction

In world agricultural practice, the use of complex biopreparations has been proven to increase the productivity of vegetable crops, to have an effective influence in preventing plant diseases, especially fusarium, and to be one of the environmentally friendly and economically inexpensive, effective means.

Soil salinity, which is considered one of the abiotic factors in the cultivation of the marketable fruits of the tomato plant, causes great damage. In saline conditions, the presence of more than 0.1% of salts in the soil or 0.25% of the dry residue is toxic for plants [1,2].

In the soils of the Aral sea regions (Republic of Karakalpakstan), such amount of salts, mainly chloride-sulfate and sulfate-chloride types of salinity, are encountered, and obtaining tomato products resistant to them is one of the main problems.

5060 hectares of vegetable crops are cultivated in the open fields of the Republic of Karakalpakstan (1420 hectares of cultivated vegetables are tomatoes). The average productivity of this crop is 2.1-2.6 times less than the average indicators of Uzbekistan.

The purpose of the research is to increase soil fertility and plant productivity by using stimulatory microbial preparations as a new innovative development in tomato growing technology in the conditions of saline soils of the Republic of Karakalpakstan.

The Object and Methods of the Research

Tomato varieties TMK-22 and Volgogradsky 5/95 and biopreparation "Zamin-M" served as objects of research. Experiments was conducted on the basis of methodological recommendations "Methodology of conducting experiments in vegetable, rice and potato growing" (2002) of B.J. Azimov and B.B. Azimov. "Statistical analysis of experimental results" (2006) of B.J. Azimov and B.B. Azimov. "Methodology of field experiment in vegetable and cucurbits crops growing" (1997) [3-6].

Research Results and Discussion

It is known from the scientific literature that plants tolerant to stress factors have many mechanisms that help to stimulate metabolic processes and limit the effects of stress factors. According to scientists, it has been shown that the amount of osmoprotector has increased in microorganisms resistant to salinity, and based on them, technologies for the preparation of dry bacterial preparations resistant to NaCl have been created [7,8].

It is worth noting that until now in the agricultural practice of our country monoculture of microorganisms was used for harvesting vegetable crops, in this study, the use of complex cultures and their effectiveness were tested in the conditions of soils with varying degrees of salinity of the Republic of Karakalpakstan.

Based on several years of screening, strains resistant to chloride and sulfate salinity (up to 200 mM) were selected from the rhizosphere of cotton, it was determined that they belong to *Bacillus subtilis*, *Bacillus megaterium* and *Pseudomonas stutzeri* species, they were deposited and a biotechnological basis was formed for the production of the complex “Zamin-M” biopreparation. It was found that the domestic strains included in the “Zamin-M” biopreparation exhibit a high level of indolyl acetic acid (ISA) synthesis even under stress conditions (pH -9). In particular, for *Pseudomonas stutzeri* SKB-308, *Bacillus subtilis* SKB-309 and *Bacillus megaterium* SKB-310 strains, this indicator was recorded as 19.4 ± 0.79 ; 20.7 ± 1.01 ; 17.74 ± 0.85 µg/ml respectively. According to the mass spectrometry analysis of the main stimulant phytohormone - indolyl acetic acid synthesis of the strains that make up the preparation, 1-bromo-2-phthalimideethane, which gives a peak in the 160 spectrum, was released as an intermediate compound, and based on scientific literature, this compound was determined as a compound with strong antagonistic activity.

A patent for the invention of the Intellectual Property Agency of the Republic of Uzbekistan was obtained for this preparation consisting of the association of microorganisms that increase the productivity of saline soils (IAP 0021 2014).

In order to study the effect of biopreparation “Zamin-M” on tomato plants in the conditions of saline soils of the Republic of Karakalpakstan, our field experiments were conducted at the educational experimental station of the Nukus branch of the Tashkent State Agrarian University in the Republic of Karakalpakstan (currently Karakalpakstan Institute of Agriculture and Agrotechnologies). Research field experiments were conducted in 2017-2018.

The soils of the experimental site are pale in color and belong to meadow alluvial soils in terms of mechanical composition. The land areas of the region consist of meadow gray and meadow soils, the level of humus supply is 0.71-0.90%. The amount of toxic salts in the arable layer is 1.02 t/ha, and this area belongs to chloride and sulfate saline soils.

As a result of studying the growth and development parameters of the tomato plant treated with the “Zamin-M” biopreparation, it was shown that it is inextricably linked with the soil climatic conditions, the rate of the applied preparation and the methods of preparing the seed material for planting, as well as with the biological properties of the tomato. It should be noted that as a result of the experiments carried out in the objects mentioned in the chapter on materials and research methods, it was observed that the options treated with “Zamin-M” had higher growth and development indicators (Table 1).

Variant	The height of the plant, cm (Average of 10 plants)	Flowering period, in days		Total yield, t/ha	Marketable productivity, t/ga	Average weight of the fruit, gr
		10%	75%			
TMK-22 (control, untreated)	62	47	59	43,1	37,7	113,5
TMK-22 (Zamin M)	85	45	54	47,5	41,5	122,8
Volgogradsky 5/95 (control, untreated)	70	46	55	45,3	39,2	130,9
Volgogradsky 5/95 (Zamin M)	84	44	53	50,3	43,9	150,7
HCP _{0,5}	4,1			3,8		

Table 1: Effect of “Zamin-M” biopreparation on tomato varieties TMK-22, Volgogradsky 5/95 grown in the regions of the Aral sea.

Under the influence of the “Zamin-M” biopreparation, compared to the control (untreated), the length of the tomato plant stem increased by 23 cm in the TMK 22 variety, and by 14 cm in the Volgogradsky 5/95 variety, the flowering period increased by an average of 2-5% in the TMK 22 variety, Volgogradsky 5/95 that it decreased by 2% in the variety, the total yield was 47.5 t/ha in the TMK-22 variety, and 50.3 t/ha in the Volgogradsky 5/95 variety, and these indicators were higher than the control by 3.8 and 4.7 t/ha, respectively.

Product yield is one of its most important indicators in the cultivation of any plant. As a result of the experiments, it was noted that in the control variants of the TMK-22 variety, this indicator is 37.7 t/ha, and the productivity increased by 3.8 t/ha under the influence of the biopreparation.



Figure 1: Productivity indicators of tomatoes when Zamin M biopreparation is used.

According to the results of the research, it was found that there are significant differences in tomato varieties TMK-22 and Volgogradsky 5/95 in terms of plant height, flowering period, and fruit weight in experimental options with and without the preparation. In particular, it was found that the weight of the fruit increased by 9.3 grams in the TMK-22 variety, and by 19.8 grams in the Volgogradsky 5/95 variety under the influence of the preparation. Also, the variants treated with biopreparation Zamin-M differed sharply from the untreated variants in terms of the growth rate of seedlings. It was observed that plants treated with the biopreparation were about 1.2-1.4 times taller than the control and differed in the strength of vegetative development.

When the total yield was studied, a higher yield of 4 t/ha, i.e. 10%, and 4.7 t/ha 10.3% was achieved in the tomato variety TMK-22.

Conclusion

Based on the obtained results, it can be concluded that the use of biopreparation “Zamin-M” in the cultivation of tomato plants in

the conditions of the saline soils of the Nukus experimental site, Aral sea region, the Republic of Karakalpakstan, caused the growth and development of plants and, as a result, increased productivity. The positive effect of the biopreparation on the tomato plant is explained by the synthesis of biologically active substances and the improvement of root nutrition.

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