

Effectiveness of the use of various biostimulants in increasing the productivity of squash crops

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Abstract. This article examines the problem of using natural biostimulants and creating new biologically active substances, introducing them into production, and increasing medicinal properties to increase the productivity of pumpkin crops in Uzbekistan. In this case, moisturising of pumpkin and cucumber seeds in biostimulators before planting, spraying during the growing season, and mixed (seed moisturising and spraying during the growing season) methods were used. As a solution to this problem, it was determined that it is useful to study the effect of biostimulants on pumpkin crops and to improve the quality of the product, to enrich its biochemical composition and to determine its medicinal properties. Research was conducted in 2018-2020 at Gulistan State University and Andijan Institute of agriculture and agrotechnology. In the cultivation of pumpkin and cucumber, plants were treated with Gossipren, Uchqun, Uchqun plus and Verva biostimulants, and the efficiency of Uchqun plus biostimulant at different rates was determined. When 0.01% Uchqun plus biostimulant was used in a mixed method, it was determined that the productivity of Ispanskaya 73 variety of pumpkin increased by 31.5 t/ha and that of Palov kadu 268 variety increased by 31.8 t/ha. When cucumber plants were affected by this method - Orzu F1 - 35.1 t/ha and 34.5 t/ha were obtained in Navruz variety.

Keywords. Gossipren, Uchqun, Uchqun plus, Verva, pumpkin, cucumber, Ispanskaya 73, Palov kadu 268.

1 Introduction

Squash (*Cucurbita pepo*) stands as a vital component of global agriculture, contributing to both culinary diversity and nutritional enrichment. As the demand for sustainable agricultural practices continues to grow, researchers and growers alike are exploring innovative techniques to enhance the productivity and quality of squash crops [1]. Among these strategies, the application of biostimulants has garnered considerable attention due to their potential to stimulate plant growth, improve nutrient uptake, and bolster overall crop performance [2, 3].

Biostimulants encompass a diverse range of substances, including natural compounds,

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microbial products, and organic materials, that are specifically designed to augment plant physiological processes [4]. By influencing root development, nutrient assimilation, and stress tolerance, biostimulants offer a multifaceted approach to optimizing crop production. While biostimulants have been widely investigated in various agricultural contexts, their effectiveness in boosting the productivity of squash crops remains a subject of growing interest and scientific inquiry [5, 6].

The objective of this study is to comprehensively evaluate the impact of different biostimulants on the growth, development, and yield of squash plants. By systematically comparing the outcomes of various biostimulant treatments, we aim to discern the most promising formulations for enhancing squash crop productivity. Our investigation delves into the potential effects of biostimulants on root morphology, nutrient absorption, flowering patterns, and fruit yield. Through this research, we aspire to provide valuable insights into the utilization of biostimulants as a sustainable means to elevate squash crop performance.

As the global population continues to expand, ensuring food security through efficient and sustainable agricultural practices is paramount [7-9]. Understanding the potential of biostimulants to enhance squash crop productivity holds promise for meeting this challenge [10, 11]. The outcomes of this study may not only contribute to advancing our knowledge of biostimulant application but also offer practical solutions to farmers seeking to optimize squash production in an environmentally responsible manner.

2 Materials and methods

The research was conducted in 2018-2020 in the experimental laboratory of Gulistan State University and in the fields of Andijan Institute of Agriculture and Agro-Technology. In this case, 4 biostimulants - Gossiprin (0.01%), Uchqun (0.01%), Uchqun plus (0.01%) and Verva (5%) were added to pumpkin Ispanskaya 73, Palav kadu 268 and cucumber Navruz and Orzu F1 varieties. Effects compared. In the experiment, a variant planted with clean water was taken as a control. In addition, in the experiment, these drugs were studied in 3 different ways, i.e. moisturising the seeds for 18 hours, foliar spraying on the plant during the growth period, and mixed methods, i.e. foliar spraying with moisturising of the seeds. Experiment with 4 replicates, feeding area is 14.0 m² in pumpkin and 8.4 m² in cucumber. The area is double, 4 m long, 4.2 m wide for pumpkins and 2.1 m for cucumbers. 14 pumpkin and 20 cucumber varieties were placed in the experiment area.

The experiment was carried out on the basis of the following methodical instructions for the cultivation of pumpkin and cucumber plants: Plots and schemes of sowing in and selection, testing and primary seed production of vegetable crops. "Guidelines for the study of the world collection for assessing the physical and mechanical properties of vegetable and melon crops", International rules for seed analysis, "Wide unified classifier SEV and the international classifier SEB of the species Cucurbitaceae", "Methodology of the field experiment", "Guidelines for the use of plant growth regulators on vegetables, melons and potatoes: recommendations", Biological products in agriculture (Methodology and practice of using microorganisms in crop and feed production), "Guidelines for methods of quality control and safety of biologically active food supplements", "Methods for the analysis of minor biologically active substances in food".

"Sample technological cards for the care of agricultural crops and production of products" for the years 2016-2020 in determining the economic efficiency of the technology of growing pumpkins and cucumbers. Based on the instructions of the published collection, the technological card for growing and harvesting pumpkin and cucumber used.

3 Results and discussion

According to the results of the study, different the effect of biostimulants on the biometric indicators of pumpkin plants were studied. The effect of various biostimulants on the growth and development of pumpkin: stem weight and leaf area were determined (see Tables 1 and 2). The length of the main stem was 180 cm in control and 207.0-245.0 cm in options with biostimulants, stem weight was 0.250 grams in control and 261.0-291.0 grams in other options. The number of lateral branches was 4 in the control, 5-7 in other options. The number of leaves in the control was 98 pieces, and in the options biostimulant used, this indicator increased to 106-118 pieces. The best performance was observed in Uchqun plus at 0.01% amount consumption, main stem length was 245 cm, stem weight was 0.291 kg, number of side branches was 7 pieces, number of leaves was 118 pieces, leaf area of one plant was 1.931 m².

Table 1. Effect of different biostimulants on the biometric indicators of pumpkin variety of Ispanskaya 73.

Options	Ispanskaya 73						Plant morbidity, %	
	Main stem length, cm	Stem weight, g	Side horn number	# of leaves, pieces	Leaf area, m ²	Plant morbidity, %		
						Mildew	Fusarium wilt	
In a method of seed moisturizing								
Control	180.0	0.250	4	98	1.729	5	1	
Gossyprene -1.0%	207.0	0.261	5	106	1.755	2	0	
Uchqun- 0.01%	230.0	0.278	6	110	1.770	0	0	
Uchqun plus -0.01%	245.0	0.291	7	118	1.931	0	0	
Verva -5.0%	225.0	0.267	5	108	1.755	1	0	
In a spray method								
Control	180.0	0.250	4	98	1.720	5	2	
Gossyprene -1.0%	189.0	0.251	5	105	1.780	2	1	
Uchqun- 0.01%	191.0	0.252	6	108	1.901	0	0	
Uchqun plus -0.01%	197.0	0.291	7	116	1.956	0	0	
Verva -5.0%	189.0	0.251	5	106	1.769	1	0	
In a mixed method								
Control	180.0	0.250	4	98	1.725	5	1	
Gossyprene -1.0%	190.0	0.320	5	108	1.705	2	0	
Uchqun 0.01%	192.0	0.340	6	113	2.157	0	0	
Uchqun plus -0.01%	195.0	0.389	7	120	2.853	0	0	
Verva -5.0%	190.0	0.332	5	108	1.998	1	0	

Table 2. Effect of different biostimulants on the biometric indicators of pumpkin variety of Palov kadu 268.

Options	Palov kadu 268						
	Main stem length, cm	Stem weight, g	Side horn number	# of leaves, pieces	Leaf area, m ²	Plant morbidity, %	
						Mildew	Fusarium wilt
In a method of seed moisturizing							
Control	165.0	0.250	4	98	1.729	5	1
Gossyprene -1.0%	177.0	0.261	5	106	1.801	2	0
Uchqun- 0.01%	190.0	0.279	6	110	1.930	0	0
Uchqun plus -0.01%	195.0	0.291	7	118	1.996	0	0
Verva -5.0%	190.0	0.268	5	108	1.869	1	0
In a spray method							
Control	165.0	0.250	4	98	1.729	5	2
Gossyprene -1.0%	189.0	0.261	5	106	1.780	2	1
Uchqun- 0.01%	191.0	0.278	6	110	1.901	0	0
Uchqun plus -0.01%	195.0	0.290	7	118	1.950	0	0
Verva -5.0%	189.0	0.267	5	108	1.769	1	0
In a mixed method							
Control	165.0	0.250	4	98	1.729	5	1
Gossyprene -1.0%	190.0	0.320	5	106	1.755	2	0
Uchqun 0.01%	192.0	0.340	6	110	2.157	0	0
Uchqun plus -0.01%	224.0	0.389	7	118	2.850	0	0
Verva -5.0%	190.0	0.332	5	108	1.998	1	0

The Ispanskaya 73 variety has a lower rate compared to the control in the spraying method. The length of the main stem was 189 cm, the weight of the stem was 0.261 kg, the number of lateral branches was 5 pieces, the number of leaves was 106 pieces, and the leaf area of one plant was 1.755 m².

In the Verva variant, these parameters are main stem length 225 cm, stem weight 0.251 kg, number of side branches 5 pieces, number of leaves 106 pieces, leaf level per plant it was 1,780 and 1,769 m². In the Uchqun variant, the length of the main stem was 191.0 cm, the weight of the stem was 0.252 kg, the number of side branches was 6 pieces, the number of leaves was 108 pieces, the leaf area of Uchqun one plant was 1.901 m².

The best performance was observed with Uchqun plus 0.01%, main stem length 197.0 cm, stem weight 0.291 kg, number of lateral branches 7 pieces, number of leaves 116 pieces, one plant leaf level It was 1,956 m². 5% of plants were affected by powdery mildew and 2% by fusarium wilt in control by spraying method. 2% of Gossypren with powdery mildew were affected by Fusarium wilt, and 1% of the Verva variety was infected with powdery mildew. No disease was observed in other variants.

Ispanskaya variety 73 in a mixed method, a low indicator compared to the control It was found in Gossipren and Verva variants, the length of the main stem was 190 cm, the weight of the stem was 0.320 and 0.332 kg, the number of lateral branches was 5 pieces, the number of leaves was 108 pieces, and the leaf area of Uchqun one plant was 1,705 and 1,998 m². In

the Uchqun variant, the length of the main stem was 192.0 cm, the weight of the stem was 0.340 kg, the number of side branches was 6 pieces, the number of leaves was 113 pieces, and the leaf area of Uchqun one plant was 2.157 m². In Ispanskaya 73 variety, the best performance was observed at the consumption of Uchqun plus 0.01%, the length of the main stem was 195.0 cm, the weight of the stem was 0.389 kg, the number of side branches was 7 pieces, the number of leaves was 120 pieces, the leaf area of Uchqun one plant was 2,853 m². In the mixed method, 5% of the plants were affected by powdery mildew and 1% by fusarium wilt. 2% of the plants were infected with powdery mildew in the Gossypren variant, and 1% in the Verva variant. No disease was observed in other variants.

The length of the main stem is 165 cm, the weight of the stem is 0.250 kg, the number of side branches is 4 pcs., the number of leaves is 98 pcs. It was 1,729 m². A low indicator compared to the control was found in the Gossypren variant, the main stem length was 177 cm, stem weight was 0.261 kg, the number of side branches was 5 pieces, the number of leaves was 106 pieces, and the leaf area of one plant was 1.801 m².

The best performance was observed with Uchqun plus 0.01%, main stem length 195.0 cm, stem weight 0.291 kg, number of side branches 7 pieces, number of leaves 118 pieces, one plant leaf level It was 1,996 m². 5% of the plants were affected by powdery mildew and 1% by fusarium wilt in the control method. 2% of Gossyprene and 1% of Verva plants were affected by powdery mildew. No disease was observed in other variants.

Palov kadu variety 268 showed low performance compared to the control in the spraying method The length of the main stem was 189.0 cm, the weight of the stem was 0.261 and 0.267 kg, the number of side branches was 5, the number of leaves was 106 and 108, and the leaf area of Uchqun one plant was 1,769 and 1,780 m². In the Uchqun variant, the length of the main stem was 191.0 cm, the weight of the stem was 0.278 kg, the number of side branches was 6 pieces, the number of leaves was 110 pieces, and the leaf area of Uchqun one plant was 1.901 m².

The best performance was observed with Uchqun plus 0.01% quantity consumption, main stem length 195.0 cm, stem weight 0.290 kg, number of side branches 7 pieces, number of leaves 118 pieces, one plant leaf level It was 1,950 m². 5% of plants were affected by powdery mildew and 2% by fusarium wilt in control by spraying method. 2% of the plants were affected by powdery mildew in gossypren, 1% by fusarium wilt. No disease was observed in other variants.

Palov kadu variety 268 showed low performance compared to control in mixed method In Gossypren and Verva variants, the length of the main stem was 190.0 cm, the weight of the stem was 0.320 and 0.332 kg, the number of side branches was 5 pieces, the number of leaves was 106 and 108 pieces, and the leaf area of Uchqun one plant was 1.705 and 1.998 m².

The best performance was observed with Uchqun plus 0.01% rate, main stem length 224.0 cm, stem weight 0.389 kg, number of side branches 7 pieces, number of leaves 118 pieces, one plant leaf level It was 2,850 m². In the mixed method control, 5% of plants were damaged by powdery mildew, 1% by fusarium wilt. 2% of plants were affected by powdery mildew in Gossypren, and 1% in Verva variant. No disease was observed in other variants.

In the experiment, the effect of biostimulants on the stem weight and leaf surface of Navruz cucumber plant was determined is, according to which the leaf area in one plant is under control when the seeds are sown by the moisturising method 1,620 m², it turned out that this indicator was slightly better in the options using Gossypren and Verva biostimulants, and the best result was obtained when using Uchqun and Uchqun plus (Tables 3 and 4).

Inferior to control It was found in Gossypren and Verva variant, the length of the main stem was 216.0 and 226.0 cm, the weight of the stem was 0.261 and 0.268 kg, the number of lateral branches was 5.2-5.4 pieces, the number of leaves was 106 and 108 pieces, the number of leaves per plant was 1.801 and It was 1,869 m².

Table 3. Effect of various biostimulants on biometric indicators of cucumber variety of Navruz.

Options	Navruz variety						
	Main stem length, cm	Stem weight, g	Side horn number	# of leaves, pieces	Leaf area, m ²	Plant morbidity, %	
						Mildew	Fusarium wilt
In a method of seed moisturizing							
Control	212	0.250	4.6	98	1.620	1.2	1
Gossyprene -1.0%	216	0.261	5.2	106	1.801	0.5	1
Uchqun-.01%	236	0.279	5.6	110	1.896	0	0
Uchqun plus -0.01%	245	0.291	5.8	118	1.931	0	0
Verva -5.0%	226	0.268	5.4	108	1.869	0	0.1
In a spray method							
Control	203	0.250	5.0	97	1.529	2.5	0.5
Gossyprene -1.0%	205	0.261	5.0	98	1.780	2.0	0.5
Uchqun- 0.01%	230	0.279	5.2	115	1.910	0	0
Uchqun plus -0.01%	232	0.291	5.2	117	1.926	0	0
Verva -5.0%	220	0.268	5.0	110	1.862	0	0
In a mixed method							
Control	203	0.250	5.0	97	1.600	2.5	0.5
Gossyprene -1.0%	205	0.261	5.0	98	1.705	2.0	0.5
Uchqun .01%	230	0.310	5.2	115	1.995	0	0
Uchqun plus -0.01%	232	0.389	5.2	117	2.157	0	0
Verva -5.0%	225	0.263	5.0	110	1.790	0	0

The best performance was observed with Uchqun plus 0.01%, main stem length 245.0 cm, stem weight 0.291 kg, number of side branches 5.8 pieces, number of leaves 118 pieces, one plant leaf level It was 1,931 m². The disease resistance of the plant was also determined in the experiment. Of course, after the seeds have germinated, observations were made in 3 periods during the growth period. Powdery mildew and fusarium wilt, common in cucumber, were observed visually (visually). 1.2% of the plants were damaged by powdery mildew and 1% by fusarium wilt in the control method. 0.5% of plants were infected with powdery mildew in Gossypren, and 0.1% in Verva variant. No disease was observed in other variants.

The effect of biostimulants on stem weight and leaf area of UchqunNavruz plant was determined, according to which, when planted by spraying method, the leaf area in one plant is under control. It was found that 1,529 m², 1,780-1,862 m² were used in the options using Gossipren and Verva biostimulants, 1,910 m² in the Uchqun variant, and 1,926 m² when Uchqun plus was used.

Main stem length is lower than control It was determined in Gossipren and Verva variants, 205.0 and 220.0 cm, stem weight 0.261 and 0.268 kg, number of side branches 5.0-5.2 pieces, number of leaves 98 and 110 pieces, leaf area of Uchqun one plant is 1,780 and 1,862 m² organized. The best performance was observed with Uchqun plus 0.01%, main stem length 232.0 cm, stem weight 0.291 kg, number of lateral branches 5.2 pieces, number of leaves 117 pieces, leaf area of Uchqun one plant was 1.926 m². 2.5% of plants were damaged by powdery mildew and 0.5% by fusarium wilt in the control by spraying method. In Gossypren,

2.0% of plants were infected with powdery mildew, 0.5% with fusarium wilt. No disease was observed in other variants.

Table 4. Effect of various biostimulants on biometric indicators of cucumber variety of Orzu F1 hybrid.

Options	Orzu F1 hybrid						
	Main stem length, cm	Stem weight, g	Side horn number	# of leaves, pieces	Leaf area, m ²	Plant morbidity, %	
						Mildew	Fusarium wilt
In a method of seed moisturizing							
Control	212.0	0.250	4.6	98	1.729	1.2	0.5
Gossyprene - 1.0%	216.0	0.261	5.2	106	1.801	0.5	0.25
Uchqun-.01%	236.0	0.279	5.6	110	1.869	0	0
Uchqun plus - 0.01%	245.0	0.291	5.8	118	1.996	0	0
Verva -5.0%	226.0	0.268	5.4	108	1.862	0	0
In a spray method							
Control	203.0	0.240	5.0	97	1.720	2.5	0.5
Gossyprene - 1.0%	205.0	0.261	5.0	98	1.780	2.0	0.5
Uchqun- .01%	230.0	0.278	5.2	115	1.901	0	0
Uchqun plus - 0.01%	232.0	0.290	5.2	117	1.956	0	0
Verva -5.0%	225.0	0.267	5.0	110	1.769	0	0
In a mixed method							
Control	203.0	0.240	5.0	97	1.725	2.5	0.5
Gossyprene - 1.0%	205.0	0.320	5.0	98	1.705	2.0	0.5
Uchqun .01%	230.0	0.340	5.2	115	2.157	0	0
Uchqun plus - 0.01%	232.0	0.389	5.2	117	2.853	0	0
Verva -5.0%	228.0	0.332	5.0	110	1.998	0	0

The effect of biostimulants on stem weight and leaf area of Uchqun Navruz plant was determined, according to which, when planted by spraying method, the leaf area in one plant is under control. It was found that 1,529 m², 1,780-1,862 m² were used in the options using Gossipren and Verva biostimulants, 1,910 m² in the Uchqun variant, and 1,926 m² when Uchqun plus was used (Tables 3 and 4).

Main stem length is lower than control It was determined in Gossipren and Verva variants, 205.0 and 220.0 cm, stem weight 0.261 and 0.268 kg, number of side branches 5.0-5.2 pieces, number of leaves 98 and 110 pieces, leaf area of Uchqun one plant is 1,780 and 1,862 m² organized.

The best performance was observed with Uchqun plus 0.01% amount consumption, main stem length 232.0 cm, stem weight 0.291 kg, number of side branches 5.2 pieces, number of leaves 117 pieces, leaf level per plant It was 1,926 m². 2.5% of plants were damaged by

powdery mildew and 0.5% by fusarium wilt in the control by spraying method. In Gossypren, 2.0% of plants were infected with powdery mildew, 0.5% with fusarium wilt. No disease was observed in other variants.

The effect of biostimulants on the stem weight and leaf area of UchqunNavruz plant was determined, according to which the leaf area in one plant is under control in the mixed method. It turned out that 1,600 m², 1,705-1,790 m² in the variants using Gossipren and Verva biostimulants, 1,995 m² in the Uchqun variant, and 2,157 m² when Uchqun plus was used.

Main stem length is lower than control. It was found in Gossipren and Verva variant, 205.0 and 225.0 cm, stem weight 0.261 and 0.263 kg, number of side branches 5.0 pieces, number of leaves 98 and 110-115 pieces, leaf area of Uchqun one plant was 1.705 and 1.790 m².

The best performance was observed in Uchqun plus at 0.01% consumption, main stem length 232.0 cm, stem weight 0.389 kg, number of side branches 5.2 pieces, number of leaves 117 pieces, leaf level per plant. It was 157 m². In the mixed method, 2.5% of plants were affected by powdery mildew and 0.5% by fusarium wilt. In Gossypren, 2.0% of plants were infected with powdery mildew, 0.5% with fusarium wilt. No disease was observed in other variants.

When the seeds of cucumber Orzu F1 hybrid were planted with biostimulants, the effect of biostimulants on plant stem length, weight and leaf area were determined, according to which, the length of the main stem in one plant was 212.0 cm in the control, 216.0-226.0 cm in the variants with Gossipren and Verva biostimulants. Cm, 236.0 cm in the Uchqun variant, and 216.0 cm when using the Uchqun plus was found to be the best.

Inferior to control. It was found in Gossipren and Verva variant, the stem weight was 0.261 and 0.268 kg, the number of side branches was 5.2-5.4 pieces, the number of leaves was 106 and 108 pieces, the leaf area of Uchqun one plant was 1.801 and 1.862 m².

The best performance was observed with Uchqun plus 0.01%, main stem length 245.0 cm, stem weight 0.291 kg, number of side branches 5.8 pieces, number of leaves 118 pieces, one plant leaf level. It was 1,931 m². 1.2% of the plants were damaged by powdery mildew and 0.5% by fusarium wilt in the control method. 0.5% of the plants were infected with powdery mildew and 0.25% with fusarium wilt. No disease was observed in other variants.

When biostimulants were sprayed on cucumber Orzu F1 hybrid, the length of the main stem in one plant was 203.0 cm in the control, 205.0-225.0 cm in the versions with Gossipren and Verva biostimulants, 278.0 cm in the Uchqun variant, and 232.0 cm when Uchqun plus was used. It turned out that it gave a good result.

Inferior to control. It was found in Gossipren and Verva variant, the stem weight was 0.261 and 0.267 kg, the number of side branches was 5.0 pieces, the number of leaves was 98 and 110 pieces, and the leaf area of Uchqun one plant was 1.780 and 1.769 m².

The best performance was observed with Uchqun plus 0.01% rate, main stem length 232.0 cm, stem weight 0.290 kg, number of side branches 5.2 pieces, number of leaves 117 pieces, leaf level per plant. It was 1,956 m². 2.5% of plants were damaged by powdery mildew and 0.5% by fusarium wilt in the control by spraying method. In Gossypren, 2.0% of plants were infected with powdery mildew, 0.5% with fusarium wilt. No disease was observed in other variants.

When biostimulants are applied to cucumber Orzu F1 hybrid in a mixed method, the length of the main stem in one plant is 203.0 cm in the control, 205.0-228.0 cm in the options with Gossipren and Verva biostimulants, 230.0 cm in the Uchqun option, and 232.0 when Uchqun plus is used. It was found that cm gave the best results.

Inferior to control. It was found in Gossipren and Verva variant, the stem weight was 0.320 and 0.332 kg, the number of side branches was 5.0 pieces, the number of leaves was 98 and 110 pieces, and the leaf area of Uchqun one plant was 1.705 and 1.998 m².

The best performance was observed in Uchqun plus at 0.01% consumption, main stem length 232.0 cm, stem weight 0.389 kg, number of side branches 5.2 pieces, number of leaves

117 pieces, leaf level per plant 2It was 853 m². In the mixed control, 2.5% of plants were damaged by powdery mildew, 0.5% by fusarium wilt. In Gossypren, 2.0% of plants were infected with powdery mildew, 0.5% with fusarium wilt. No disease was observed in other variants.

According to the results of the research, it can be concluded that in terms of the rate and methods of using different biostimulants in the cultivation of pumpkin and cucumber plants, the highest indicator in all varieties and methods is in the 0.01% version of Uchqun plus biostimulant and in the mixed method.

Data on the effect of various biostimulants on the yield of courgette crops were analyzed (Tables 5 and 6).

Table 5. Effect of various biostimulants on yield indicators of pumpkin variety of Ispanskaya 73.

Options	Ispanskaya 73				
	Total yield, t/ha	Yield of 1 bush, kg	Commodity harvest, t/ha	Marketable yield, %	Relative to control, %
In a method of seed moisturizing					
Control (cooling with water)	27.9	1.6	26.8	96.2	100.0
Gossyprene -1.0%	28.5	2.1	27.6	97.2	102.1
Uchqun – 0.01%	31.0	2.2	30.3	97.8	111.1
Uchqun plus -0.01%	31.1	2.2	30.8	99.1	111.5
Verva -5.0%	29.0	2.1	28.3	97.6	103.9
In a spray method					
Control (cooling with water)	27.0	1.6	26.0	96.2	100.0
Gossyprene -1.0%	27.7	2.0	26.9	97.0	102.6
Uchqun – 0.01%	30.5	2.1	29.8	97.7	113.0
Uchqun plus -0.01%	30.8	2.2	30.5	99.0	114.0
Verva -5.0%	28.1	2.0	27.4	97.5	104.1
In a mixed method					
Control (cooling with water)	28.2	1.6	27.1	96.2	100.0
Gossyprene -1.0%	28.8	2.1	28.0	97.3	102.1
Uchqun – 0.01%	31.4	2.2	30.7	97.9	111.3
Uchqun plus -0.01%	31.8	2.2	31.5	99.2	112.8
Verva -5.0%	30.5	2.1	29.7	97.7	108.2
LSD ₀₅	0.5	-	0.91	-	-
Sx%	0.30	-	1.2	-	-

It provides information on the total yield of the pumpkin plant, the yield of 1 bush, the marketable yield, the percentage of marketable yield and the comparison with the control. In the experiment, when the Ispanskaya 73 variety of pumpkin was treated with biostimulants, the yield in the control variant was 27.9 t/ha, the yield of 1 bush was 1.6 kg, the yield was 26.8 t/ha, and the yield of the yield was 96.2%. . Productivity between options is 28.5-31.1 t/ha, yield of 1 bush is 2.1-2.2 kg, marketable yield is 27.6-30.8 t/ha, share of marketable yield is 97.2-99.1% organized. The best result is the Uchqun plus drug0.01% in terms of consumption, 31.1 t/ha per hectare, yield of 1 bush 2.2 kg, marketable yield 30.8 t/ha, marketable yield 99.1%, 11.5% more than control.

Table 6. Effect of various biostimulants on yield indicators of pumpkin variety of Palov kadu 268.

Options	Palov kadu 268				
	Total yield, t/ha	Yield of 1 bush, kg	Commodity harvest, t/ha	Marketable yield, %	Relative to control, %
In a method of seed moisturizing					
Control (cooling with water)	26.5	1.6	25.5	96.2	100.0
Gossyprene -1.0%	28.0	2.1	27.2	97.0	105.7
Uchqun – 0.01%	30.1	2.2	29.8	97.8	115.1
Uchqun plus -0.01%	30.5	2.2	30.2	99.0	113.6
Verva -5.0%	28.5	2.1	27.8	97.6	107.5
In a spray method					
Control (cooling with water)	26.5	1.6	25.5	96.2	100.0
Gossyprene -1.0%	27.1	2.1	26.3	97.0	102.3
Uchqun – 0.01%	29.9	2.2	29.1	97.4	112.8
Uchqun plus -0.01%	30.0	2.2	29.9	98.0	113.0
Verva -5.0%	27.8	2.1	27.1	97.4	105.0
In a mixed method					
Control (cooling with water)	26.5	1.6	25.5	96.2	100.0
Gossyprene -1.0%	27.4	2.1	26.6	97.2	103.4
Uchqun – 0.01%	30.0	2.2	29.4	97.9	113.2
Uchqun plus -0.01%	30.2	2.2	30.0	99.5	114.0
Verva -5.0%	28.5	2.1	27.9	97.9	107.5
LSD ₀₅	0.5	-	0.97	-	-
Sx%	0.32	-	1.3	-	-

When treated by seed spraying with biostimulants in the Ispanskaya 73 variety, the yield in the control variant was 27.0 t/ha, the yield of 1 bush was 1.6 kg, the marketable yield was 26.0 t/ha, and the output of the marketable crop was 96.2%. The productivity of the options was 27.7-30.8 t/ha, the yield of 1 bush was 2.0-2.2 kg, the marketable yield was 26.9-30.5 t/ha, the output of the marketable crop was 97.0-99.0% . The best result is Uchqun plus biostimulator 0.01%It was observed in the amount consumption, 30.8 t/ha per hectare, the yield of 1 bush was 2.2 kg, the marketable yield was 30.5 t/ha, the output of the marketable crop was 99.0%.

When the Ispanskaya 73 variety was treated with biostimulants in a mixed method, the yield in the control variant was 28.2 t/ha, the yield of 1 bush was 1.6 kg, the marketable yield was 27.1 t/ha, and the output of the marketable crop was 96.2%.

When these indicators are analyzed among options, the productivity is 28.8-31.8 t/ha, the yield of 1 bush is 2.1-2.2 kg, the marketable yield is 28.0-31.5 t/ha, the output of the marketable crop is 97.3- It was 99.2%. The best result is Uchqun plus biostimulator 0.01%in terms of consumption, it was 31.8 t/ha per hectare, the yield of 1 bush was 2.2 kg, the marketable yield was 31.5 t/ha, the output of the marketable crop was 99.2%.

When treated with biostimulants in the 268 variety of Palov kadu, the yield in the control option was 26.5 t/ha, the yield of 1 bush was 1.6 kg, the marketable yield was 25.5 t/ha, and the output of the marketable crop was 96.2%. Productivity between options is 28.0-30.5 t/ha, yield of 1 bush is 2.1-2.2 kg, marketable yield is 27.2-30.5 t/ha, marketable yield is 97.0-99.0% organized. Also in this variety is the drug Uchqun plus 0.01%the best result was

obtained in terms of quantity consumption, 30.5 t/ha per hectare, 2.2 kg of yield per bush, 30.2 t/ha of marketable yield, 99.0% of marketable yield.

When paddy pumpkin variety 268 is treated by spraying with biostimulants, the yield between options is 27.1-30.0 t/ha, the yield of 1 bush is 2.1-2.2 kg, the yield is 26.3-29.9 t/ha, the yield is 26.3-29.9 t yield was 97.0-98.0%. The best result is the Uchqun plus drug 0.01% 30.0 t/ha per hectare, yield 2.2 kg, marketable yield 29.9 t/ha, marketable yield 98.0%.

When seeds are processed in a mixed method with biostimulants in Palov kudu 268 variety, the inter-variant yield is 26.5-30.2 t/ha, the yield of 1 bush is 1.6-2.2 kg, the yield is 25.6-30.0 t/ha, marketable yield was 96.2-99.5%. The best result in this variety is the Uchqun plus drug 0.01% it was obtained in the variant where the norm was used, the yield per hectare was 30.2 t/ha, the yield of 1 bush was 2.2 kg, the marketable yield was 30.0 t/ha, the output of the marketable crop was 99.5%.

In the experiment, the effect of biostimulants on the productivity of cucumber plants was given, according to which, when Navruz variety seeds were planted with biostimulants, the total yield in the control was 27.6 t/ha, the yield of 1 bush was 1.2 kg, and the total yield was 25.7 t/ha (Tables 7 and 8). The total yield of the options was 31.0-34.0 t/ha, the yield of 1 bush was 1.35-1.5 kg, and the marketable yield was 29.3-32.8 t/ha. The best result was the total yield of 34.0 t/ha, the yield of 1 bush was 1.5 kg and the marketable yield was 32.8 t/ha at the consumption amount of 0.01% of Uchqun plus.

Table 7. Effect of biostimulants on yield indicators of cucumber variety of Navruz.

Options	Navruz				
	Total yield, t/ha	Yield of 1 bush, kg	Commodity harvest, t/ha	Marketable yield, %	Relative to control, %
In a method of seed moisturizing					
Control (cooling with water)	27.6	1.2	25.7	93.1	100.0
Gossyprene -1.0%	31.0	1.35	29.3	94.5	112.3
Uchqun - 0.01%	32.2	1.4	30.6	95.0	116.7
Uchqun plus -0.01%	34.0	1.5	32.8	96.6	123.2
Verva -5.0%	31.3	1.36	29.6	94.7	113.4
In a spray method					
Control (cooling with water)	27.6	1.2	25.7	93.1	27.6
Gossyprene -1.0%	32.2	1.30	30.7	95.2	116.7
Uchqun - 0.01%	33.4	1.46	32.2	96.4	121.0
Uchqun plus -0.01%	33.5	1.60	32.6	97.4	121.4
Verva -5.0%	33.3	1.40	31.7	95.2	120.7
In a mixed method					
Control (cooling with water)	27.6	1.2	25.7	93.1	27.6
Gossyprene -1.0%	32.2	1.4	30.7	95.2	116.7
Uchqun - 0.01%	33.6	1.6	32.9	97.9	121.7
Uchqun plus -0.01%	35.1	1.71	34.9	99.4	127.2
Verva -5.0%	33.1	1.45	31.5	95.3	119.9
LSD ₀₅	0.5	-	0.27	-	-
Sx%	0.7	-	1.0	-	-

When applied in a mixed method, the total yield between variants was 27.6-35.1 t/ha, the yield of 1 bush was 1.2-1.71 kg, and the total yield was 25.7-34.9 t/ha. At the rate of 0.01% of Uchqun plus, the best result was determined by this method, the total yield was 35.1 t/ha,

the yield of 1 bush was 1.71 kg, the marketable yield was 34.9 t/ha, and 27.2% more than the control was obtained. .

When cucumber Orzu F1 hybrid seeds were planted with biostimulants, the total yield in control was 29.9 t/ha, the yield of 1 bush was 1.3 kg, and the marketable yield was 27.7 t/ha. The total yield of the options was 32.2-34.0 t/ha, the yield of 1 bush was 1.4-1.5 kg, and the total yield was 30.7-32.8 t/ha. The best result was the total yield of 34.0 t/ha, the yield of 1 bush was 1.5 kg, the marketable yield was 32.8 t/ha, 13.7% more than the control.

When biostimulants were sprayed on cucumber Orzu F1 hybrid, the total yield between variants was 29.9-34.5 t/ha, the yield of 1 bush was 1.3-1.65 kg, and the total yield was 27.7-33.6 t/ha. The best result was the total yield of 34.5 t/ha, the yield of 1 bush was 1.65 kg, and the marketable yield was 33.6 t/ha at the consumption amount of 0.01% of Uchqun plus.

When biostimulants were applied to cucumber Orzu F1 hybrid in a mixed method, the total yield between variants was 29.9-36.8 t/ha, the yield of 1 bush was 1.3-1.75 kg, and the total yield was 27.7-36.2 t/ha . The best result was the total yield of 36.8 t/ha, the yield of 1 bush was 1.75 kg, the marketable yield was 36.2 t/ha, and 23.0% more than the control.

Table 8. Effect of biostimulants on yield indicators of cucumber variety of Orzu F1 hybrid.

Options	Orzu F1 hybrid				
	Total yield, t/ha	Yield of 1 bush, kg	Commodity harvest, t/ha	Marketable yield, %	Relative to control, %
Control (cooling with water)	29.9	1.3	27.7	92.8	100.0
Gossyprene -1.0%	32.2	1.4	30.7	95.2	107.7
Uchqun - 0.01%	33.6	1.46	32.4	96.4	112.4
Uchqun plus -0.01%	34.0	1.5	32.8	96.6	113.7
Verva -5.0%	33.3	1.45	31.7	95.2	111.4
Control (cooling with water)	29.9	1.3	27.7	92.8	100.0
Gossyprene -1.0%	31.0	1.35	29.3	94.5	103.7
Uchqun - 0.01%	32.2	1.4	30.6	95.0	107.7
Uchqun plus -0.01%	34.5	1.65	33.6	97.4	115.4
Verva -5.0%	32.6	1.42	30.9	94.7	109.0
Control (cooling with water)	29.9	1.3	27.7	92.8	100.0
Gossyprene -1.0%	33.3	1.4	30.7	95.2	111.4
Uchqun - 0.01%	34.5	1.46	32.8	95.2	109.7
Uchqun plus -0.01%	36.8	1.75	36.2	98.4	123.0
Verva -5.0%	33.4	1.44	32.2	96.4	107.7
LSD ₀₅	0,5		0,97		
Sx%	0,34		1,1		

4 Conclusions

1. According to the amount of phytohormones in the stem and root of pumpkin crops, under the influence of 0.01% Uchqun plus biostimulator, the amount of kinetin in the above-ground part of pumpkin was 0.123 mg/ml, and in the root part was 0.041 mg/ml. The amount of indole fatty acid (IMA) obtained as a standard solution was 0.010 mg/ml in the stem, but its amount was not detected in the root.

2. The amount of kinetin in the root part of cucumber was 0.037 mg in the control, 0.131 mg in the Gossypren and Verva variant, 0.134 mg in the Uchqun variant, and 0.136 mg in the Uchqun plus, or 267.5% more than the control. The amount of indole acetic acid in the root was 0.002 mg/ml in the control variant, 0.001 mg/ml in the Gossypren, Verva, Uchqun and Uchqun plus variants, 50% more than the control.

3. The method of optimal application of various biostimulants to the biometric indicators of courgette crops was determined. In this case, the most effective mixed method, under the influence of polyphenols contained in 0.01% Uchqun plus biostimulant, has been proven to accelerate the growth and development of pumpkin crops and increase resistance to diseases. In the Ispanskaya 73 variety of pumpkin, the length of the main stem is 195.0 cm, the weight of the stem is 0.389 kg, the number of lateral branches is 7 pieces, the number of leaves is 120 pieces, the leaf area of Uchqun one plant is 2,853 m², 2% with flour and dew in the Gossypren version, and 1 in the Verva version % plant infected. No disease was observed in other variants.

4. The length of the main stem is 224.0 cm, the weight of the stem is 0.389 kg, the number of side branches is 7 pcs., the number of leaves is 118 pcs. 2,850 m², 5% of plants were affected by powdery mildew and 1% by fusarium wilt. 2% of plants were affected by powdery mildew in Gossypren, and 1% in Verva variant. No disease was observed in other variants.

5. Cucumber Navruz variety main stem length is 245.0 cm, stem weight is 0.291 kg, number of side branches were 5.8 pieces, number of leaves were 118 pieces, one plant leaf level was 1,931 m². In the Orzu F1 hybrid, the length of the main stem was 232.0 cm, the weight of the stem was 0.389 kg, the number of side branches was 5.2 pieces, the number of leaves was 117 pieces, and the leaf area of Uchqun one plant was 2.853 m². In the mixed control, 2.5% of plants were damaged by powdery mildew, 0.5% by fusarium wilt. In Gossypren, 2.0% of plants were infected with powdery mildew, 0.5% with fusarium wilt. No disease was observed in other variants.

6. Uchqun plus biostimulator 0.01% in option 1, the Ispanskaya 73 variety of pumpkin produced a marketable yield of 31.5 t/ha or 12.8% more compared to the control, and the Palav pumpkin 268 variety produced a marketable yield of 30.0 t/ha or 14.0% more compared to the control. Cucumber Navruz variety yielded 34.9 t/ha, 27.2% higher than the control, Orzu hybrid yielded 36.2 t/ha, 23.0% higher than the control.

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