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EFFECTS OF DIFFERENT PLANNING SCHEMES ON THE BIOCHEMICAL COMPOSITION AND YIELD OF VEGETABLES PLANTED IN UNHEATED GREENHOUSE CONDITIONS

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ABSTRACT

This article provides information on the study of hot pepper varieties «Margilan 330», «Uchkun», «Tillarang» in different planting schemes (70x20, 70x30, 70x40, 70x50 cm) in unheated greenhouse conditions. The quality and size of the fruit weight depended on the feeding area. As the plant's nutritional area increased, so did the commercial fruit weight and yield. According to the results of the experiment, the highest yield among varieties was 7,5 kg/m^2 when planting schemes 70x40 cm, 7 kg/m^2 when planting schemes Margilan 330 70x40 cm, 6,3 kg/m^2 when planting schemes 70x40 cm. The study of the biochemical composition of fruits also reported an increase in the amount of dry matter, ascorbic acid (vitamin C), bitterness, mono and disaccharide, nitrate in high-yielding varieties. According to the results of the study, the nitrates in the fruit of hot pepper are in the minimum and maximum range (120-180 mg/kg), indicating that they do not affect the human body.

Key words: hot peppers, unheated greenhouse, varieties, planting scheme, number of fruits, fruit weight, yield, biochemical composition, dry matter content, ascorbic acid (vitamin C), bitterness, mono and disaccharide, nitrate content.

INTRODUCTION

Greenhouse vegetable growing is one of the main branches of agriculture and plays an important role in providing the population with fresh, cervitamin products in the off-season. In recent years, the country has been taking comprehensive measures to ensure food security, in particular, to fully meet the needs of vegetable products and expand the range of vegetable products. As a result, in recent years, the demand for fresh vegetables in the off-season for our people is growing. A number of research works are being carried out in the country to improve the technology of growing hot peppers in unheated greenhouses, one of the low-cost vegetable crops.

One of the important factors determining the yield of vegetable crops is the optimal planting schemes of the plant. Maximum use of light in the placement of plants in the greenhouse is an important factor in creating an optimal heat, water, air, nutrient regime.

This is done taking into account the biological properties of these crops. When placing vegetable crops, of course, it is necessary to choose the right scheme of planting them. Otherwise, the planted vegetable crops will not grow and develop at the same time, and the level of marketability will decrease without ripening at the time of harvest. In unheated greenhouse conditions of hot pepper plant can be dramatically increased

productivity based on the width of the specific row spacing and the number of plants per unit area, ie the selection of the optimal feeding area..

There is a lot of information in foreign and local literature on the study of different planting schemes to obtain a rich and high-quality crop of hot peppers, according to which hot peppers are planted in different open and protected areas in different planting schemes 70x20, 80x15, 90x10, 60x30 cm, and in protected areas 70x40, 80x35 and 90x30 cm for planting seedlings in planting schemes are given recommendations [1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11].

For these purposes, the following options were selected and studied to determine the optimal feeding area for the cultivation of hot pepper in greenhouses.

Options	Planting schemes
I	70x20
II	70x30 (control)
III	70x40
IV	70x50

MATERIALS AND METHODS

The experiments were conducted in the greenhouses of the Research Institute of Vegetable, melon crops and potato in 2018-2020. The institute is located in the Tashkent district of the Tashkent region, north of Tashkent. The climate is characterized by continental variable and dry air with sufficient light and heat. The duration of sunlight is 2700-3000 hours per year, with summer sunlight being 360-400 hours per month and 90-130 hours in winter. The daily temperature variability is high (10-15^{0}C in winter and 15-20^{0}C in summer) and reaches 30^{0}C throughout the year. The greenhouse soil is a typical gray soil with pre-irrigation, groundwater is located at a depth of 6-7 meters, the humus content in the greenhouse soil is 1,0-1,36%, mobile phosphorus 12,8-29,3 mg/kg, potassium 197,5-285,6 mg/kg and N-NO_3 12,1-21,9 mg/kg. Mobility is P_2O_5-14,8-36,3 mg/kg, K_2O-157,5-215,5 mg/kg.

Unheated greenhouse, seeds of hot pepper Margilan 330, Tillarang and Uchkun varieties, plants, fruits are the object of this study.

RESULTS AND DISCUSSION

Planting schemes should be determined on the basis of experimental results, taking into account the soil-climatic conditions of the unheated greenhouse, the method of cultivation and the biological characteristics of the plant. Planting too close or too long between seedlings also affects the growth and productivity of the plants.

In view of the above, research has been conducted to identify and study the most suitable planting schemes for hot peppers in unheated greenhouse conditions.

In the study, hot peppers were studied by planting in 4 planting schemes (70x20, 70x30, 70x40 and 70x50 cm) (Table 1).

Table 1

Number of fruits, fruit weight and yield indicators of hot pepper varieties planted in different planting schemes in unheated greenhouse conditions (2018-2020).

Options	Planting schemes	The fruits are in a bush at the time of technical ripening						Productivity	
		number of fruits		the weight of one fruit		total fruit weight			
		pieces	%	g.	%	kg.	%	kg/m^2	%
Margilan 330									
I	70x20	121	101,7	7,6	73,1	0,9	75,0	6,4	114,3
II	70x30(control)	119	100,0	10,4	100,0	1,2	100,0	5,6	100,0
III	70x40	116	97,5	19,7	189,4	2,2	183,3	7,7	137,5
IV	70x50	105	88,2	22,6	217,3	2,3	191,7	6,6	117,9
	average	115,3	96,8	15,1	145,0	1,7	137,5	6,5	116,1
Uchkun									
I	70x20	96	104,3	10,0	75,8	1,0	53,3	6,8	119,3
II	70x30(control)	92	100,0	13,2	100,0	1,8	100,0	5,7	100,0
III	70x40	90	97,8	24,1	182,6	2,1	116,7	7,9	138,6
IV	70x50	88	95,7	28,7	217,4	2,5	138,9	7,1	124,6
	average	91,5	99,5	19,0	143,9	1,8	102,2	6,9	120,6
Tillarang									
I	70x20	89	102,3	10,2	76,7	0,9	81,8	6,4	118,5
II	70x30(control)	87	100,0	13,3	100,0	1,1	100,0	5,4	100,0
III	70x40	82	94,3	25,1	188,7	2,0	181,8	7,2	133,3
IV	70x50	79	90,8	30,6	230,1	2,4	218,2	6,7	124,1
	average	84,3	96,8	19,8	148,9	1,6	145,5	6,4	119,0

Margilan 330, Uchkun, Tillarang varieties of hot pepper were planted on February 20 in different planting schemes. At the time of technical ripening of fruits of Margilan 330 variety, the number of fruits in one bush was 119 in the control variant planted in the scheme 70x30 cm, 100%, 121 in the variant planted in the scheme 70x20 cm, which is 2 pieces higher than the control variant, ie 1,7%. As the planting schemes increased, the number of fruits decreased compared to the control option. This pattern was also observed in the Uchkun and Tillarang varieties.

Fruit weight, on the other hand, showed the opposite, i.e., as the planting schemes increased, the weight of the fruits increased due to the expansion of the feeding area. In the control variant planted in the scheme 70x30 cm, the weight of one fruit was 10,4 grams 100%, in the scheme 70x40 cm 19,7 grams, in the control variant 9,3 grams, in the scheme 70x50 cm 22,6 grams, in the control variant 12,2 grams. The fruits were high in weight. When the weight of the fruits was analyzed, as the planting schemes became smaller, the weight of the fruits decreased and the quality of the product decreased. Of course, this figure depended on the plant's absorption of nutrients from the soil.

In the control variant planted on the 70x30 cm scheme, the yield was 5,6 kg per square meter, while in the variant planted on the 70x20 cm scheme, the yield was 6,4 kg, which is 0,8 kg (m^2) more than the control variant. Although the yield in this planting scheme was higher than the control option, the yield was lower than the yield control option. This was due to the fact that the plant could not provide enough nutrients to the fruit in the variant planted in the scheme 70x20 cm. In the variants planted in the 70x50 and 70x40 cm schemes, the yield was 6,6 and 7,7 kg per square meter, which was 17,9-37,5% higher than the control variant. The quality and size of the fruit weight depended on the feeding area. As the nutritional area of the plant increased, so did

the weight and yield of the branded fruit. For this reason, in the cultivation of hot peppers in unheated greenhouse conditions is very important to take into account the feeding area of the plant. Large or small feeding area can cause product quality to be good or bad.

This pattern was also observed in the Uchkun and Tillarang varieties of hot peppers planted experimentally.

Table 2 shows the dry matter, ascorbic acid (vitamin C), bitterness, mono and disaccharide and N-NO3 indicators in the fruits of Margilan 330, Uchkun and Tillarang varieties planted in different planting schemes in unheated greenhouse conditions.

Only during the biological ripening of hot pepper fruits, the biochemical composition of fruits, ie the amount of dry matter, ascorbic acid, the degree of bitterness, mono and disaccharides, the amount of nitrate were determined in the laboratory. According to laboratory analyzes, there was an effect of planting schemes on the biochemical composition of the fruits. According to the study, the amount of dry matter in the control variant planted in the 70x30 cm scheme of biologically ripe fruits Margilan 330 was 59,1%, in the 70x20 cm scheme 58,1% or 0,2% less than in the control scheme, 70x40 and 70x50 cm planting light the amount of dry matter increased to 59,9 and 60,2%, respectively, due to further decline, which was 0,8-1,1% higher than the control option. Margilan 330 variety had 143,3 mg of ascorbic acid in the fruit when planted in the control 70x30 cm planting scheme, while 142,4 mg or 1 mg less than the control when planted in 70x20 cm. 143,7 mg when planted 70x40 cm, 144,0 mg in the 70x50 cm planting scheme or 0,3% higher than the control. The increase in the number of seedlings in the experimental area led to a decrease in the amount of ascorbic acid in the fruit. The amount of capsaicin in the fruit of hot pepper or the degree of bitterness is measured on the basis of the Scovelli scale.

Table 2

Biochemical composition of fruits of hot pepper varieties planted in different planting schemes in unheated greenhouse conditions (2018-2020)

Options	Planting schemes	Dry matter	Ascorbic acid, (vitamin C)	Bitterness (point)	Mono and disaccharide	N-NO_3
		%	mg	%	%	mg/kg
Margilan 330						
I	70x20	58,9	142,4	3,0	5,1	115,2
II	70x30 (control)	59,1	143,3	4,0	5,3	116,0
III	70x40	59,9	143,7	5,0	5,5	117,4
IV	70x50	60,2	144,0	5,0	5,6	117,7
average		**59,5**	**143,3**	**4,3**	**5,3**	**116,6**
Uchkun						
I	70x20	61,3	144,1	3,0	6,3	122,4
II	70x30 (control)	62,1	145,8	5,0	6,4	123,1
III	70x40	63,3	146,0	5,0	6,5	124,0
IV	70x50	63,7	146,2	5,0	6,6	124,4
average		**62,6**	**145,5**	**4,5**	**6,4**	**123,4**
Tillarang						
I	70x20	62,8	136,0	3,0	6,7	119,1

II	70x30 (control)	63,1	138,4	4,0	7,0	120,2
III	70x40	64,4	144,3	5,0	7,2	121,0
IV	70x50	64,7	137,3	5,0	7,4	121,7
average		**63,8**	**139,0**	**4,3**	**7,1**	**120,5**

It was observed that the degree of bitterness was 4 points in the control variant planted in the 70x30 cm scheme of Margilan 330 variety, 3 points in the variant planted in the 70x20 cm scheme or 1 point less than in the control variant. The bitterness level was 5 points in the 70x40 cm and 70x50 cm planted varieties, and 1 point higher than in the control planted variant. In these planting schemes, the increase or decrease in bitterness depends on the thickness of the bush when the plant is planted, the amount of light falling on the plant (photosynthesis), the formation of the main and side branches of the plant, and good absorption of nutrients from the soil.

In the control variant of Margilan 330 planted in the scheme 70x30 cm, mono and disaccharide were 5,3%, in the variant 70x20 cm 5,1%, in the variant 70x40 and 70x50 cm 5,5-5,6%. or 104–106% higher than the control.

Nitrates in plant fruits pose a risk to human health. The weight was 70 kg and 700 mg of nitrates were found to be harmful to an adult. This amount should be 10 mg per 1 kg of body weight for adults and 4-5 mg for children. The World Health Organization has set a limited allowable concentration of 260 mg for nitrates and 15 mg for nitrites. For crops grown in the open for the CIS countries, their amount is set at 120-180 mg / kg, especially in hot peppers. The amount of nitrates depends on the degree of ripeness of the fruit. In young fruits they are more than in ripe ones. These data confirm the high accumulation of nitrates in early harvested potato tubers, carrot roots, salads and other leafy vegetables.

The amount of nitrates in vegetables also depends on their size, weight and time of harvest. They had the highest levels of nitrates during the day, ranging from 5 a.m. to 9 p.m. and from 9 p.m. to 24 p.m. Therefore, it is better to pick vegetables in the afternoon or early morning.

In our study, it was found that the content of nitrates in the fruits of the control variant of Margilan 330 planted in the scheme 70x30 cm is 116 mg/kg. In the remaining variants, the nitrate content was around 115,2-117,7 mg/kg. This difference in variants was repeated in the Uchkun and Tillarang varieties. However, the content of nitrates in the fruits of these varieties was 3,9–6,8 mg/kg higher than in Margilan-330. Our data show that the nitrates in peppers, were in the range of minimum and maximum, and amounted to the allowable amount.

CONCLUSIONS

1. In the control variant planted in the 70x30 cm scheme, the weight of one fruit was 10.4 grams 100%, in the 70x40 cm scheme 19.7 grams, in the control variant 9.3 grams, in the 70x50 cm scheme 22.6 grams, in the control variant 12.2 grams the fruits were high in weight.
2. In the analysis of fruit weight, the weight of the fruit decreased and the quality of the product decreased as the planting schemes decreased, while the weight of the fruit and the quality of the product increased in the expanded variants of the planting schemes..
3. In the variants planted in the schemes 70x50 and 70x40 cm, the yield was 6,6 and 7,7 kg per square meter, which was 17,9-37,5% higher than the control variant. The quality and size of the fruit weight depended on the feeding area.

4. In the control variant of Margilan 330 variety planted in 70x30 cm scheme, the content of nitrates in fruits was 116 mg/kg, in Uchkun variety – 115,2 mg/kg, in Tillarang variety – 117,7 mg/kg.
5. According to the results of the study, the nitrates in the fruit of hot pepper were in the minimum and maximum range (120-180 mg/kg) and showed no effect on the human body.

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