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Isolation of adaptive varieties of tomato and innovative technologies for their cultivation on slightly saline soils of the Bukhara region

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Abstract: The article presents the results of assessing the collection of tomato hybrid varieties in terms of early maturity, adaptability, formation of the leaf surface, tops, root system and productivity, and as a result, high-yielding, adaptive hybrid varieties and the improvement of the elements of agricultural technology for their cultivation, such as irrigation regimes, fertilizer rates, planting patterns and standing density for slightly saline soils. It was revealed that hybrid varieties of tomato were distinguished - Seraj F1, Tomck F1, Bobcat F1, Lojain F1, which formed tall plants (51.3- 60.2 cm), root weight - 124-144 g, tops - 473-574 g, fruit yield per bush – 1525.5-2470.5 g. These hybrid varieties provided the highest yield (67.8-109.8 t/ha). In the selected adaptive hybrid varieties, the optimal soil moisture regime was not lower than 75-85-85% of the PSMC and the application of fertilizers at the rate of 20 t/ha of manure + N200P160K100 kg/ha. At the same time, the yield of hybrid varieties (48.6-88.1 t/ha), the yield per 1 m3 of water was the highest (5.7-9.8 kg), and the water consumption per 1 centner of the crop was the 2-17.5 m3) and the content of nitrates in fruits did not exceed the recommended norm (44.7-67.8 mg/kg). The optimal planting scheme was 90x25 cm, with a density of 44.4 thousand plants per 1 ha, where it provided a high yield (25.3-90.0 tons).

Keywords: Varieties of tomato, innovative technologies, Early maturity, adaptability, formation of the leaf surface, tops, root system.

Introduction: The Bukhara region of Uzbekistan is characterized by specific soil and climatic conditions, a low level of provision of the population with the volume of tomato production, and the yield does not exceed 20-22 tons from 1 hectare. The increase in tomato yield under these conditions largely depends on the selection of highly productive, adaptive, resistant varieties to soil salinity, diseases and pests and other extreme factors, the organization of scientifically based local primary and elite seed production, the development and widespread introduction of the main elements of agricultural cultivation technology, such as the timing of planting seedlings, planting pattern and density of standing, irrigation regime, fertilizer rates and others, the solution of which is of great scientific and practical importance. It is relevant that although the tomato is the leading vegetable crop in the republic, the need has not been satisfied to this day. The main reasons for this, taking into account each soil-climatic region, the

assessment of the collection of various hybrid varieties, that adaptive tomato hybrid varieties have not been identified, the lack of high-quality varietal seeds [1-4].

The purpose of the study is to study the collection of early, mid-early and mid-ripening tomato hybrid varieties under the conditions of slightly saline soils of the Bukhara region, to identify promising adaptive hybrid varieties on their basis and by studying irrigation regimes, norms of organic and mineral fertilizers, planting patterns and standing density, improve agricultural technology cultivation of selected hybrid varieties.

METHODS

Field experiments were carried out in the conditions of irrigated meadow alluvial soils of the farm “Khamroev Khalil Bozorovich” of the Zhandor district of the Bukhara region in the following areas:

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Experience-1. Comprehensive assessment of the collection of tomato hybrid varieties in terms of early maturity, growth, development, formation of the leaf surface area, tops, root system, fruit formation, productivity, total and marketable yields by collections and, on their basis, the selection of promising, adaptive hybrid varieties for slightly saline meadow alluvial soils.

18 varieties and heterotic tomato hybrids were tested. Plot area - 18 m2, 3-fold repetition. Planting of seedlings with 5-7 true leaves was carried out according to the scheme 90x25cm on April 5-12.

Experience-2. To study the selected varieties-hybrids of tomato under the given conditions of growth, development, bush formation, productivity, yield and quality of the harvest under various irrigation regimes and fertilizer rates.

In this field experiment, the selected tomato hybrid varieties - Tomsk F1, Red stone, Bobcat F1, Lojain F1 were studied under two irrigation regimes for pre-irrigation soil moisture of 65-75-75 and 75-85-85% of the pre-irrigation soil moisture content (PSMC). In each irrigation regime, 5 norms of fertilizers were studied (N150P120K75, N200P160K100, 20 t/ha of manure + N150P120K75, 20 t/ha of manure + N200P160K100, 20 t/ha of manure + N250P200K125 kg/ha).

Plot area for irrigation - 720 m2, for fertilizer - 144 m2, 3-fold repetition. Accounting for irrigation water was carried out using the weir "Cipoletti". And the irrigation rate was taken into account by the moisture deficit in the soil layer (0-50, 0-70 and 0-100 cm).

Experience-3. To determine the influence of the planting pattern and standing density on the growth, productivity, total and marketable yield of the selected tomato hybrid varieties. To do this, they were planted and compared with each other according to the scheme 90x30cm (control), 90x25cm, 90x20cm with a standing density of 36.6, 44.4 and

55.5 thousand plants per 1 ha.

The plot area according to the planting scheme is 144 m2, and according to hybrid varieties - 36 m2, 3-fold repetition. All records, observations, calculations and analyzes on the experimental plot were carried out according to the generally accepted methodology and agro-recommendations [5-9].

All field experiments were laid in one field contour, the soils of the experimental plot are characterized by a humus content of 0.97-1.12%, gross nitrogen - 0.102-0.115%, phosphorus - 0.171-0.188%, and potassium - 1.96-2.03 %, reaction in aqueous extract pH=7.2-7.3, degree of salinity is slightly chloride (0.310-0.412% chlorine ion).

RESULTS AND DISCUSSION

The collection of hybrid varieties of tomato in terms of growth, development, formation of the leaf surface area, tops, roots, fruits, productivity indicators, harvest yields and commercial yields differed significantly (Table 1).

The data showed that the growing season, that is, the period from planting seedlings to 1-harvest, in the group of early-ripening hybrid varieties was 50-57 days, in the group of medium-early hybrid varieties - 59-64 days, and in mid-season - 69-71 days. In the group of early-ripening hybrids, all hybrid varieties differed from the standard variety Mustaqillik-28 by fruit ripening 1-7 days earlier, in the group of medium-early hybrid varieties, only the Terra Cotta F1 hybrid had a vegetative period of 59 days, and in the standard variety Volgogradsky 5/95 - 60 days. days, and in other hybrid varieties studied, the growing season was 2-4 days longer. In the group of mid-ripening varieties, the duration of the growing season was at the level of the standard, only in the hybrid H2274 F1 - 71 days, that is, 2 days longer.

Table 1. Growth, development, productivity, productivity and marketability of fruits of varieties (hybrids) of tomato on slightly saline soils (2022-2024)

№	Variety name (hybrid) and origin	growing season, in days	Plant height, cm (during flowering)	Weight from 1 bush, g				Weight of 1 fruit from a bush, g	Total yield, t/ha
				roots	haulm	fruits	the ratio of fruits and tops		
	Early varieties								
1.	Mustaqillik-28(st.)	53	46,0	105	460	859,5	1:1,8	139,0	38,2
2.	Ogastin (DE)	57	49,3	116	479	949,5	1:1,9	217,2	42,2
3.	Lojain F1(NL) (ст.)	50	51,3	124	473	1525,5	1:3,6	197,4	67,8
4.	Tomck F1(NL)	54	60,2	144	574	2470,5	1:4,0	329,6	109,8
5.	Bobcat F1(NL)	54	55,7	130	510	2119,5	1:4,1	277,3	94,2
6.	Seraj F1(NL)	54	57,2	135	546	2025,0	1:3,7	358,3	90,0
	Mid-early varieties								
7.	Rio-grande(NL)(ст.)	62	34,6	104	466	929,3	1:1,9	127,6	41,6
8.	Volgogradsky 5/95(RU)	60	43,5	112	450	573,8	1:1,5	137,1	28,2
9.	Red stone (USA)	64	46,0	126	490	1035,0	1:2	153,0	45,6
10.	Yusupov(UZ)	61	36,0	130	516	753,8	1:1,6	315,5	34,4
11.	Vostok (UZ)	64	36,2	103	464	623,3	1:1,6	84,8	30,9
12.	BT 1019 F1 (TR) (ст.)	59	48,2	102	475	299,3	1:0,08	30,2	14,2
13.	Terra cotta F1(NL)	59	49,9	127	502	785,3	1:1,4	183,2	34,0
14.	Wolverine F1(NL)	61	50,7	129	510	918,0	1:1	243,2	39,1
	Mid-season varieties								
15.	Floradade (US)(ст.)	69	47,2	144	486	877,5	1:2	106,1	41,6
16	Campbell (DE)	69	45,9	117	485	821,3	1:1,9	253,9	39,0
17.	H2274 F1 (TR)(ст.)	71	46,3	120	490	720,0	1:1,8	103,4	35,0
18	Pink trind F1(NL)	71	52,0	134	545	990,0	1:1,8	225,0	44,4

The group of early-ripening hybrid varieties from other groups of hybrid varieties had relatively tall, branched, with a high leaf surface area, powerful tops, root system and fruit yield. Tomato hybrid varieties - Bobcat F1, Lojain F1, Tomsk F1, Seraj F1 were especially distinguished by these indicators. At the same time, plant height was 51.3-60.2 cm, fruit yield per bush – 1525,5-2470,5 g, where the ratio of fruits and tops differed 1:3.6-4.1. Relatively high growth and productivity indicators were observed in the mid-early variety Red stone, mid-season variety Floradade, hybrid Pink trind F1, where the yield of fruits per bush was 877.5-1035.0 g, the ratio of fruits and tops was 1:1.8-2.0. In the studied tomato hybrid varieties, the average weight of fruits varied significantly, the largest fruits (147.4-329.6 g) were obtained from hybrids Seraj F1, Tomck F1, Bobcat F1, Pink trind F1. The Floradade variety had an average fruit weight of 106.1 g, while the Red stone variety had an average fruit weight of 153.0 g. Under the conditions of slightly saline soils from the studied tomato varieties in the group of early ripe hybrid varieties, the highest yield was provided by the hybrids Tomck F1 – 109.8 t/ha, Bobcat F1 – 94.2 t/ha,

Seraj F1 – 90.0 t/ha, Lojain F1 – 67.8 t/ha. The early maturing variety Augustin, the mid- early variety Red stone, the mid-season variety Floradade, the hybrid Pink trind F1 yielded 41.6-44.4 tons per hectare. And in other tested hybrid varieties, the yield was at the level of the standard variety, that is, 30.9-41.6 t/ha, the lowest yield (14.2 t/ha) was noted in the hybrid BT 1019 F1.

Thus, relative to salt tolerance, growth, development, formation of a powerful leaf surface, tops, root system, productivity and yield by collection, as well as precocity and adaptability, tomato hybrid varieties - Seraj F1, Tomck F1, Bobcat F1, Lojain F1, Red stone, Pink trind F1 (Figure 1).

Fig. 1. General view of the fruits of selected adaptive varieties - tomato hybrids.

Under the conditions of irrigated meadow alluvial slightly saline soils, the growth, development, formation of productivity and marketable yields in selected hybrid varieties of tomato are the main determining factor is the optimization of the irrigation regime and fertilizer rates.

In order to establish optimal irrigation regimes and fertilizer rates, we have studied irrigation regimes for pre-irrigation soil moisture of 65-75-75 and 75-85-85% of the PSMC and in each of these, 5 fertilizer rates were studied, i.e. N150P120K75, N200P160K100, 20 t/ha of manure + N150P120K75, 20 t/ha of manure + N200P160K100 and 20 t/ha of manure + N250P200K125 kg/ha.

It has been established that in the selected tomato hybrid varieties, optimal for growth, formation, tall, with the largest leaf surface area, powerful tops, root system, the highest productivity rates were noted while maintaining the irrigation regime for pre-irrigation soil moisture not lower than 75-85-85% of the PSMC and application of organomineral fertilizers at a rate of 20 t/ha of manure + N200P160K100 kg/ha.

At the same time, the highest yield was achieved in tomato hybrid varieties (Tomck F1 – 88.1 t/ha, Bobcat F1 - 72.7 t/ha, Lojain F1 – 77.9 t/ha, Red stone – 48.6 t/ha), the yield per 1 m3 of irrigation water was the highest for the Red stone variety - 5.7; hybrid Tomck F1 - 9.8; Bobcat F1 - 9.7 and Lojain F1 - 8.0 kg, or the consumption of irrigation water per 1 quintal of crop was the lowest (10.2-17.5 m3), and in fruits the nitrate content did not exceed the recommended norm and was within 44.72-67.18 mg/kg.

It was revealed that in order to obtain a yield of 45-80 t/ha and more in the selected adaptive varieties and hybrids of tomato, it is necessary to maintain pre-irrigation soil moisture at least 75-85-85% of the PSMC and apply organomineral fertilizers at a rate of 20 t/ha of manure + N200P160K100 kg/ha. To maintain the irrigation regime for pre-irrigation soil moisture at the level of 75-85-85% of the PSMC, 20 irrigations are necessary according to the 2-3-15 scheme ("planting seedlings - flowering" - 2 times, "flowering - fruiting" - 3 times and "fruiting -harvesting" - 15 irrigations) with an irrigation rate of 500-600 m3/ha and an interval every 5-11 days, an irrigation rate of 8200-8700 m3.

In slightly saline soils, one of the main factors determining the yield of a tomato is planting patterns and planting density. Preservation, ensuring the density of standing from salinity and adverse climatic factors and maintaining soil moisture at an optimal level largely depends on the row spacing and planting patterns. Taking this into account, we have comparatively studied planting schemes of 90x30 cm (control), 90x25 and 90x20 cm with a standing density of 37.0, 44.4 and 55.5 thousand plants per 1 ha,

respectively, in the selected adapted Red stone tomato hybrid varieties, Bobcat F1, Lojain F1 Mustaqillik-28 and Volgogradsky 5/95 (st.).

The highest yield of hybrid varieties 25.3-90.0 t/ha with a large mass of marketable fruits (85.8-214.2 g) was observed with a scheme of 90x25 cm with a density of 44.4 thousand plants per 1 ha. When planting seedlings 90x20 cm with a density of 55.5 thousand plants per 1 ha, the yield increases, but within the Least Significant Difference the increase did not exceed 2.5 t/ha.

CONCLUSIONS

1. Seraj F1, Tomck F1, Bobcat F1, Lojain F1 differed in early ripe tomato hybrid varieties. Plant height was 51.3-60.2 cm, weight of roots (124-144 g), tops), the yield of fruits from the bush (1525.5- 2470.5 g), that the ratio of fruits and tops was 1: 3.6-4.1. Relatively high growth and productivity indicators were observed in the mid-early variety Red stone, mid-season variety Floradade, hybrid Pink trind F1, where the yield of fruits per bush was 877.5-1035.0 g, the ratio of fruits and tops was 1:1.8-2.0. In the studied tomato hybrid varieties, the average weight of fruits varied significantly, and the largest fruits (147.4-329.6 g) were noted in the hybrids Seraj F1, Tomck F1, Bobcat F1, Pink trind F1. The highest yield was provided by early ripe tomato hybrids - Tomck F1 (109.8 t/ha), Bobcat F1 (94.2 t/ha), Seraj F1 (90.0 t/ha), Lojain F1 (67.8 t/ha). The early ripe variety Augustin, mid-early variety Red stone, mid-season variety Floradade, hybrid Pink trind F1 yielded 41.6-44.4 tons per hectare.

2. Under the conditions of weakly saline soils, the main factor determining the growth and development of plants, the formation of productivity and marketable yields in selected adaptive tomato hybrid varieties is the optimization of the irrigation regime and fertilizer rates. It was revealed that in the selected hybrid varieties of tomato, favorable for growth, the formation of the largest leaf surface area, a powerful root system and tops, were noted under the irrigation regime for pre-irrigation soil moisture of at least 75-85-85% of the PSMC and the application of organomineral fertilizers at a rate of 20 t/ha manure+N200P160K100 kg/ha. At the same time, the highest yield was provided by tomato hybrid varieties (Tomck F1 – 88.1 t/ha, Bobcat F1 – 72.7 t/ha, Lojain F1 – 77.9 t/ha, Red stone – 48.6 t/ha), the yield per 1 m3 of irrigation water was the highest (5.7-9.8 kg) or the consumption of irrigation water per 1 quintal of crop was the lowest (10.7-17.5 m3), and the content of nitrates in fruits did not exceed recommended norm and amounted to 44.72-

67.18 mg/kg.

3. In slightly saline soils, one of the factors determining the yield of tomato is the planting pattern and standing density. Preservation and provision of standing density from salinity and adverse climatic factors and maintaining soil moisture at an optimal level largely depends on the row spacing and planting patterns. It has been established that under the conditions of slightly saline soils, the planting scheme of 90x25 cm with a density of 44.4 thousand plants per 1 ha turned out to be optimal for the selected adaptive tomato hybrid varieties. At the same time, the highest yield was obtained for varieties and hybrids (25.31-90.0 t/ha).

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