

Selection Of Tomato Varieties And Hybrids

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Abstract.

For the first time in the conditions of Uzbekistan, a collection of stem varieties and hybrids was comprehensively studied and a promising starting source for selection work was allocated. Argo, Perst, Chelnok, Revansh, Otradnyy, Severyanka samples with a validity period of 93–97 days are recommended for creating early varieties. Valuable determinant (38–61 cm) for selection work – Perst, Chelnok, Severyanka, Revansh, Otradnyy, Fonarik, Argo, Alpateva 905a, Utenok, Sevara, Marjona, Bahadir and semi-determinant varieties (74–84 cm) – Surkhan 142, Volgogradsky 5/95, Taramata, Sugdiyona, Utenok varieties are separated. The highest total productivity was observed in Fonarik, Revansh, Utenok, Surkhan 142 varieties and they gave 8-31% higher yield in the first period and 8-32% in the second period compared to the comparative variety. 10 first-generation hybrids obtained based on cross-breeding of stock varieties and comprehensively evaluated. The highest total yield in first generation hybrids G1 Surkhan 142 x Sevara, G1 Sevara x Taramata, G1 Dostlik x L-31, G1 Surkhan 142 x Marjona, G1 Surkhan 142 x L-31, G1 Dostlik x Marjona, G1 Volgogradsky 5/95 x Marjona was observed in combinations. The total productivity of these hybrids was 72.0–83.0 t/ha in the first period, and 57.2–71.6 t/ha in the second period. The effect of heterosis in these hybrids was 131–160% in the first term, and 120–163% in the second term. It was in these hybrids that the highest effect of heterosis on early yield was observed: 134–192% in the first term and 117–179% in the second term. A selection test of the promising bardam variety Bardam has been organized and it is being prepared for the State variety test and submission to the Intellectual Property Agency.

Key words: tomato, stem, determinant, semi-determinant, period of validity, productivity, fruit weight, hybrid, heterosis effect.

Introduction.

Tomato is the most widely grown and consumed vegetable crop worldwide and is one of the 15 major agricultural crops that are widely grown in the world. According to "FAOSTAT" data, in 2021 the countries that grow the most tomatoes in the world are China (62.9 million tons), India (19.0 million tons), USA (10.6 million tons), Turkey (12.8 million tons), It is grown on a large scale in Italy (5.3 million tons), Iran (5.3 million tons), Spain (5.0 million tons), Mexico (4.3 million tons), and Brazil (3.9 million tons). Tomato is the leading vegetable crop in Uzbekistan. In 2019, tomatoes were grown on an area of 58.88 thousand hectares in our republic, and the total yield was 2.12 million

tons, and the average yield was 36.0 t/ha [<http://stainformation.ru/sel/tomat.html>];]

Depending on the plant type, tomato varieties are divided into 2 groups: ordinary (var. vulgare (Alef.) Brezh.) and stem-like (var. validum (Bailey) Brezh.). 80% of the varieties used in production belong to the ordinary group. Varieties belonging to both groups are divided into 2 types depending on the height of the plant: determinant (controlled by the sp gene) and indeterminate (controlled by the sp+ gene). Determinant varieties can be very low (small) (30–45 cm) and medium (50–70 cm) tall. Indeterminate varieties are very tall (from 70 cm to 500 cm), and they are grown partly in open fields, mainly in sheltered areas. Stem varieties can be superdeterminant, determinant, semi-determinant, indeterminate. The

columnar type (var. *validum* (Bailey) Brezh.) includes varieties with an upright stem that bends only under the influence of the weight of the fruits. The sign of stomatism is associated with useful physiological and morphological characteristics. It has been found that usually stem varieties are resistant to heat and drought (Avdeev, 2006; 2012; Kondrateva, 2010).

According to the research of I.Yu. Kondrateva [2010], the leaves of stem varieties have high photosynthetic activity, which allows for a higher potential yield compared to ordinary varieties. When good and quality seedlings are planted early, the stem varieties develop well and allow to get a yield of 100 t/ha and above. G.V. Mukhortova, N.I. In the experiments conducted by Kudryashova [2009], the productivity of the stem-like Astrakhansky 5/25 and Yurevsky varieties in the drip irrigation system was 136–140 t/h.

Sudden changes in the weather in Uzbekistan, extreme temperature rise in the summer months, water shortage have made it more difficult to grow tomatoes in open fields and get a higher yield.

Taking this into account, great attention is being paid to the creation of stem varieties and their wide use in production in the following years.

Currently, scientists of scientific research centers of the Russian Federation, Ukraine, the Republic of Belarus, Armenia, and the United States of America have determined that tomatoes belonging to the stem type (var. *validum* (Bailey) Brezh.), i.e., with an upright stem, are affected only by the weight of the fruits.

Great work has been done in the field of creating new varieties and hybrids with flexible, strong leaves, resistant to unfavorable conditions of the external environment.

Research objects and methods.

18 stem like variety samples brought from various scientific research institutes served as the object of research. The research was conducted in two periods. In the first term, seeds were sown in the greenhouse on January 10, and seedlings were transplanted under film covers on March 20. In the second period, the seeds were sown on February 12 and the seedlings were transplanted into the open field on April 10.

Investigations: : Guidelines for the study and maintenance of the world collection of vegetable nightshade crops (tomatoes, peppers, eggplants) [L., VIR, 1977]; Guidelines for breeding varieties and hybrids of tomato for open and protected ground [M., VNISSOK, 1986]; Guidelines for the ecological testing of vegetable crops in open

ground [M., VNISSOK, 1987]; Methodology of the State variety testing of agricultural crops [M., 1975. Part IV]; Guidelines for approbation of vegetable crops and fodder root crops [13; 415-b]] was conducted on the basis of style and methodological guidelines. Statistical analysis of the obtained data Dospikhov B.A. (1985) method was performed in Microsoft Excel computer program.

Research results.

A description of the main development phases of the samples of the studied cultivars is presented in Table 1. Information about individual development phases and the duration of the entire vegetation period is very important in the selection of early varieties and hybrids. According to academician A.V. Alpatov (1981) studies, development periods such as "sprouting-flowering" and "flowering-fruit ripening" are passed from generation to generation independently of each other. This, in turn, makes it possible to obtain very early forms by crossing varieties with short periods.

Argo, Otradnyy, Chelnok, Sugdiyona, Bahadir, L-31, Utenok, Alpatova 905a with a short "germination-flowering" period (58-64 days) in the first planting period, and with a short period (57-63 days) in the second period Argo, Perst, Chelnok, Revansh, Fonarik, Sevara varieties were distinguished.

The short period of "flowering-ripening of fruits" (41-45 days) was observed in Perst, Chelnok, Revansh, Otradnyy, Taramata, Sevara varieties in the first term. Argo, Perst, Chelnok, Revansh, Otradnyy, Severyanka, Sugdiyona, Bahadir, Alpatova 905a, Taramata, Volgogradsky 5/95, Surkhan 142, Marjona, Dostlik varieties stood out in the second period due to the shortness of this period (32-39 days). In the second period, the high air temperature slightly accelerated the ripening of the fruits. For this reason, 14 out of 18 studied varieties had a short "flowering-fruit ripening" period.

The shortest growth period, that is, the short period of "germination-ripening of fruits" (93-97 days) was observed in **Argo, Perst, Chelnok, Revansh, Otradnyi, Severyanka** varieties, and they were included in the group of early varieties. The short growing season in these varieties was mainly due to the shortening of the second period, i.e. the "flowering-fruit ripening" period.

In the varieties Surkhan 142, Volgogradsky 5/95, Dostlik, Utenok, Marjona, Taramata, Bahadir, Sugdiyona, L-31, the length of the period of validity was 113-123 days in the first term and 104-113 days in the second term. These varieties belong to the group of medium and late varieties.

In the initial material, the description of characters such as plant height, fruit weight, shape, color, plant habit, foliage is also of great importance. These indicators facilitate the selection of morphobiologically close parental forms in breeding. According to plant height, the studied variety samples were divided into the following groups:

a) determinant varieties are characterized by the growth of side branches after the main stem stops growing after producing 4-6 flowers. These include Perst, Chelnok, Severyanka, Revansh, Otradnyy, Fonarik, Argo, Alpatava 905a, Utenok, Sevara, Marjona, Bahadir varieties with a plant height of 38 to 61 cm;

b) semi-determinate varieties are characterized by a weak manifestation of determinacy, that is, limitation of stem growth. This group includes varieties with a plant height of 74–84 cm, such as Surkhan 142, Volgogradsky 5/95, Taramata, Sugdiyona, Utenok.

Thus, we have cultivars with different plant height, which are valuable in selection of stock cultivars. serves as a starting source. According to the average fruit weight, the studied variety samples were divided into the following groups:

a) small-fruited (from 30 grams to 60 grams): Perst, Chelnok, Sevara, Severyanka, Revansh, Otradnyy, Alpatava 905a, Marjona, Argo. Fruit weight in these varieties was 42-50 g;

b) medium-fruited (from 60 grams to 100 grams): Sugdiyona, , Argo, Utenok, Taramata, Fonarik, L-31, Dostlik. The fruit weight of these varieties was 64-100 grams;

c) large fruits (more than 100 grams): Surkhan 142, Volgogradsky 5/95;

d) very large fruits (178-191 g): It is a rating. It should be noted that the fruits of Perst, Chelnok, Taramata, Revansh, Sugdiyona, Marjona varieties are very dense and transportable, and they can serve as a starting source for selection work on this very important character.

Table 1:The duration of the development periods of tomato variety samples, 2020-2021.

№	Variety samples	Planting period	Duration of development phases, days		
			from germination to flowering	from flowering to ripening	validity period,
1	2	3	4	5	6
1	Friendship, St.	I	67	46	113
		II	71	39	110
2	Utenok	I	64	49	113
		II	73	40	113
3	Sevara	I	66	45	111
		II	63	49	112
4	Marjona	I	69	54	123
		II	67	34	111
5	Surkhan 142	I	70	46	116
		II	66	38	104
6	Volgogradsky 5/95	I	66	47	113
		II	71	36	107
7	Taramata	I	72	44	116
		II	71	36	107
8	L-31	I	64	52	116
		II	67	40	107
9	Alpatava 905a	I	61	48	109
		II	71	36	107
10	Bahadir	I	62	55	117
		II	69	38	107
11	Flashlight	I	64	49	113
		II	57	49	106
12	Sugdiyana	I	63	56	119
		II	69	36	105
13	Severyanka	I	62	48	110
		II	65	32	97
14	Otradnyy	I	59	41	100
		II	60	37	97
15	Rematch	I	61	44	105
		II	59	37	96
16	Chelnok	I	62	43	105
		II	57	37	94
17	Perst	I	62	41	103
		II	57	37	94
18	Argo	I	58	50	108
		II	57	36	93

Planting periods had a significant effect on the yield of the stem variety samples. Total yield was higher in all cultivars without exception in the first planting period, Table 2. Comparative yield of Dostlik variety in the first term was 51.1 t/h. In the second term, this indicator was 40.4 t/ha. In the first period, the productivity increased by 26.5% compared to the second period. In other varieties, the yield in the first period was 4.0% to 29.4% higher than in the second period.

Table 2:Productivity of tomato variety samples, (2019-2021 year)

Tp	Samples	Planting term	Productivity					
			General	As a % relative to the comparative variety	The next one	As a % relative to the comparative variety	Goods	As a % relative to the comparative variety
1	Friendship, st	I	51,1	100	37,5	100	48,5	100
		II	40,4	100	30,4	100	38,4	100
2	Flashlight	I	67,4	131	55,3	147	64,0	132
		II	52,1	129	42,1	138	49,5	129
3	The revenge	I	58,0	114	49,4	132	55,1	114
		II	53,3	132	44,4	146	50,6	132
4	Utenok	I	55,2	108	42,6	114	52,4	108
		II	48,3	120	34,9	115	45,9	120
5	Surkhan 142	I	55,0	108	37,4	99	52,3	108
		II	50,8	126	34,2	113	48,3	126
6	Otradnyy	I	54,3	106	48,6	130	51,6	106
		II	42,7	106	30,2	99	40,6	106
7	Sevara	I	53,1	104	44,7	119	50,4	104
		II	47,7	118	32,3	106	45,3	118
8	Sogdiana	I	51,1	100	40,0	107	48,5	100
		II	42,7	106	27,8	91	40,6	106
9	Bahadir	I	49,2	96	38,6	103	46,7	96
		II	41,5	103	25,9	85	39,4	103
10	L-31	I	47,5	94	36,4	97	45,1	93
		II	43,8	108	27,6	91	41,6	108
11	Marjona	I	46,4	90	39,3	105	43,8	90
		II	37,2	92	26,9	88	35,3	92
12	Severyanka	I	44,1	86	33,8	90	41,9	86
		II	41,5	103	26,7	88	39,4	103
13	Argo	I	43,5	94	35,5	95	41,3	85
		II	39,1	97	26,7	88	37,1	97
14	Alpatava 905a	I	43,4	84	29,7	79	41,2	85
		II	39,4	98	28,6	94	37,4	97
15	Taramata	I	41,0	80	34,0	91	38,9	80
		II	39,4	98	26,9	88	37,4	97
16	Volgogradsk y 5/95	I	40,0	78	29,5	79	38,0	78
		II	37,4	93	28,2	93	35,5	92
17	Shuttle	I	39,3	76	31,6	84	37,3	77
		II	37,5	93	28,3	93	35,6	93
18	Perst	I	34,2	67	28,1	75	32,5	67
		II	29,1	72	21,2	70	27,6	72

The highest total productivity was observed in Fonarik, Revansh, Utenok, Surkhan 142 varieties. These cultivars yielded 8–31% higher yield in the first period and 8–32% higher yield in the second period than the reference cultivar. The productivity of studied varieties such as Otradnyy, Sevara, Sugdiyona was slightly higher than the comparative variety or equal to it. A similar situation was observed in terms of early yield. Fonarik, Revansh, Utenok varieties gave 14–47% higher early yield in the first period and 15–47% in the second period compared to the comparative variety. Otradnyy, Sevara varieties only gave 19–30% higher early yield compared to the comparative variety only in the first term.

The following 10 first-generation hybrids were obtained based on the cross-breeding of stem varieties: Dostlik x L–31, Dostlik x Marjona, Surkhan 142 x Taramata, Surkhan 142 x L–31, Surkhan 142 x Sevara, Surkhan 142 x Marjona, Surkhan 142 x Chelnok, Volgogradsky 5/95 x Marjona, Sevara x Volgogradsky 5/95, Sevara x Taramata.

In all parent forms, the highest yield was observed in the first term. The highest productivity was observed in Surkhan 142, Sevara, Dostlik varieties. In the first term, their yield was 51.1–55.0 t/ha, and in the second term it was 40.4–50.8 t/h.

The research has undoubtedly confirmed that the creation and wide use of the first generation hybrids of stem tomatoes is a promising direction. The highest total yield in first generation hybrids G1 Surkhan 142 x Sevara, G1 Sevara x Taramata, G1 Dostlik x L–31, G1 Surkhan 142 x Marjona, G1 Surkhan 142 x L–31, G1 Dostlik x Marjona, G1 Volgogradsky 5/95 x Marjona was observed in combinations. The total productivity of these hybrids was 72.0–83.0 t/ha in the first period, and 57.2–71.6 t/ha in the second period. The effect of heterosis in these hybrids was 131–160% in the first term, and 120–163% in the second term.

It was in these hybrids that the highest effect of heterosis on early yield was observed: 134–192% in the first term and 117–179% in the second term (Table 3).

Table 3 Productivity of first-generation tomato stem hybrids, (2019–2021)

T/p	Varieties and hybrids	Planting period	Хосилдорлик, т/га					Goods	Compared to the comparative variety, in %
			General	The effect of heterosis, %	The next one	Compared to the comparative variety, in %	Goods		
Varieties									
1	Surkhan 142	I	55,0	-	37,4	-	52,3	-	
		II	50,8	-	34,2	-	48,3	-	
2	Sevara	I	53,1	-	44,7	-	50,4	-	
		II	47,7	-	32,3	-	45,3	-	
3	Friendship	I	51,1	-	37,5	-	48,5	-	
		II	40,4	-	30,4	-	38,4	-	
4	L-31	I	47,5	-	36,4	-	45,1	-	
		II	43,8	-	27,6	-	41,6	-	
5	Marjona	I	46,4	-	39,3	-	43,8	-	
		II	37,2	-	26,9	-	35,3	-	
6	Taramata	I	41,0	-	34,0	-	38,9	-	
		II	39,4	-	26,9	-	37,4	-	
7	Volgogradsky 5/95	I	40,0	-	29,5	-	38,0	-	
		II	37,4	-	28,2	-	35,5	-	
8	Chelnok	I	39,3	-	31,6	-	37,3	-	
		II	37,5	-	28,3	-	35,6	-	
Hybrids									
9	F1 Surkhan 142 x Sevara	I	83,0	151	61,4	164	78,9	151	
		II	61,6	121	39,1	134	58,5	121	
10	F1 Sevara x Taramata	I	83,0	156	58,8	132	78,9	157	
		II	57,2	120	40,9	127	54,3	120	
11	F1 Friendship x L-31	I	82,0	160	61,7	165	77,9	161	
		II	71,6	163	49,3	179	68,0	163	
12	F1 Surkhan 142 x Marjona	I	79,0	144	71,9	192	75,1	144	
		II	62,5	123	40,3	118	59,4	123	
13	F1 Surkhan 142 x L-31	I	72,0	131	50,1	134	68,4	131	
		II	64,8	128	40,1	117	61,6	128	
14	F1 Sevara x Volgogradsky 5/95	I	65,0	122	46,1	103	61,8	123	
		II	46,7	98	31,4	98	44,4	98	
15	F1 Friendship x Marjona	I	61,0	119	43,1	115	58,0	120	
		II	52,5	130	32,2	106	49,9	130	
16	F1 Surkhan 142 x Taramata	I	60,0	109	44,0	118	57,0	109	
		II	50,0	98	34,2	100	47,5	98	
17	F1 Volgogradsky 5/95 x Marjona	I	58,0	125	41,8	94	55,1	109	
		II	57,8	155	41,8	148	54,9	155	
18	F1 Surkhan 142 x Chelnok	I	44,0	80	28,8	77	41,8	80	
		II	37,5	74	29,5	86	35,6	74	

Figure 2. Tomato stem hybrids of the first generation productivity, (2019–2021)

A selection test of the Bardam variety, created in the course of research, was conducted. The total productivity of the New Bardam variety was 57.5 t/ha, which is 9.5% higher than the comparative Surkhan 142 variety. The highest marketable yield was observed in the Bardam variety, which was 55.4 t/ha, and was 18.1% higher than the comparative Surkhan 142 variety,

Table 4. Productivity of tomato in the selection test of the transportable new Bardam variety (2019–2021)

Varieties	Total productivity, t/ha	Compared to the comparative variety, %	Commercial yield, t/ha	Compared to the comparative variety, %
Surkhan 142, st.	52,5	100	46,9	100
Bardam	57,5	109,5	55,4	118,1
HCP ₀₅	2,6		1,9	
S,%	1,6		1,5	

According to the results of the research, the Bardam variety was found to be promising. Compared to the comparative Surkhan 142 variety, this variety is characterized by high general and commercial yield, transportability of fruits and

suitability for shipping over long distances. The standing of the stem, the location of the tuber is related to the industrial cultivation of the new variety

allows mechanization of processes. The new Bardam variety is being prepared for submission to the State Variety Testing Center and the Intellectual Property Agency.

Conclusions

1. Under the conditions of Uzbekistan, tomato stock varieties and hybrids were studied for important economic characteristics in different periods and a valuable initial resource was allocated for selection work.

2. The shortest growth period (93–97 days) was observed in Argo, Perst, Chelnok, Revansh, Otradnyy, Severyanka varieties and they were included in the group of early varieties.

3. According to plant height, the studied stem varieties were divided into the following groups:

a) determinant varieties (38–61 cm) – Perst, Chelnok, Severyanka, Revansh, Otradnyy, Fonarik, Argo, Alpatyeva 905a, Utenok, Sevara, Marjona, Bahadir;

b) semi-determinant varieties (74–84 cm) – Surkhan 142, Volgogradsky 5/95, Taramata, Sugdiyona, Utenok.

4. By fruit weight, the studied varieties are divided into 4 groups:

a) small-fruited varieties (30–60 g) – Perst, Chelnok, Sevara, Severyanka, Revansh, Otradnyy, Alpatyeva 905a, Marjona, Argo;

b) medium-fruited varieties (60–100 g) – Sugdiyona, Argo, Utenok, Taramata, Fonarik, L-31, Dostlik;

c) varieties with large fruits (more than 100 g) – Surkhan 142, Volgogradsky 5/95;

d) variety with very large fruits (more than 150 g) – Value

5. Planting periods had a significant effect on the yield of stem varieties. High yields were observed in all varieties during the first planting period. Fonarik, Revansh, Utenok, Surkhan 142 varieties, which gave a higher yield compared to the comparative variety, were isolated in both periods. They gave 8-31% higher yield in the first period and 26-32% in the second period compared to the comparative variety.

6. For the first time, 10 stem-like G1 hybrids were created and thoroughly studied. In the hybrids of the first generation, the highest total productivity was observed in combinations G1Surkhon 142 x Sevara, G1Sevara x Taramata, G1Dostlik x L-31, G1Surkhon 142 x Marjona, G1Surkhon 142 x L-31, G1Dostlik x Marjona, G1Volgogradskiy 5/95 x

Marjona. The total productivity of these hybrids was 72.0–83.0 t/ha in the first period, and 57.2–71.6 t/ha in the second period.

The effect of heterosis in these hybrids was 131-160% in the first period, and 120-163% in the second period.

7. As a result of the selection test, it was determined that the stocky Bardam variety is promising. Its total yield was 57.5%. It was 9.5% higher than the comparative Surkhan 142 variety.

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