# YIELD AND HETEROSIS EFFECT OF TOMATO FIRST GENERATION (F1) HYBRIDS

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*Abstract:: In the article, in 2018-2019, the yield indicators of tomato hybrids of the first generation at the Surkhandarya Scientific Experimental Station were studied. According to the results, Surkhan 142 x Taramata, Taramata x Volgogradsky 5/95, Surkhan 142 x Volgogradsky 5/95 and L-31 have the highest heterosis efficiency (33.7-74.2%) in terms of total and early yield and total yield. x Surkhan 142 hybrids were separated.*

*High (15.3-23.0%) heterosis efficiency in terms of early yield was observed in hybrids Taramata x Volgogradsky 5/95, Surkhan 142 x Taramata and MJ-46 x Surkhan 142.*

*These hybrids are also notable for their resistance to the tuber nematode. These hybrids can be recommended for production after certain trials and are a valuable starting source for the development of better resistant cultivars and hybrids with valuable economic traits.*

*Key words: tomato, selection, line, heterosis, nematode, resistance, variety, transportability, source, score.*

## 1. Introduction

The first selective varieties of tomatoes were obtained using the analytical selection method. It was created on the basis of individual and collective selection of local and acclimatized foreign forms. Some of them are small, cultivated in small areas.

Varieties grown in modern agriculture should be not only productive, but also comprehensively resistant to environmental discomforts that occur during the period of operation and adapted to intensive technologies. Many years of experience show that currently 30-40% of the potential yield of existing varieties, and 50-60% under the best conditions, are not used, and the main reason for this is the lack of environmental resistance in the varieties (Juchenko A.A., 1986).

Tomato is a year-round source of the most important vitamins S1, V1, V2, RR, A, N, V9, pectins, valuable minerals. It is also a nutritious food that determines a person's healthy diet and protection from many diseases.

At the expense of selection, it is possible not only to increase the yield, but also to increase the quality of the fruit and its suitability for sending over long distances, to extend its storage, to mechanize cultivation and harvest. Breeding also

limits or completely stops crop losses caused by harmful diseases and pests, plant parasites, in turn, reduces the use of toxic chemicals in tomato cultivation and environmental pollution (Avdeev A.Yu. 2006).

The creation and production of new high-yielding varieties resistant to biotic and abiotic environmental factors and G'1 hybrids, as well as the development of effective technologies for their cultivation, is the main factor for increasing productivity and improving product quality. Therefore, great attention is being paid to the scientific development of improved breeding methods to create new varieties and G'1 hybrids all over the world.

In 2018-2019, the study of hybrids in the nursery has different morphobiological characteristics: the plants are simple, stem-like; and the shape of the fruit is round, flat-round, oval; fruits are hard, transportable; 12 first-generation hybrids obtained from cross-breeding of varieties and lines resistant to nematodes were studied in comparison with parental forms and the comparative F1 Nurafshon hybrid in the direction of earliness, resistance to nematode, nematode and transportability.

F1Surkhan 142 x Taramata, F1Surkhan142 x Volgogradsky 5/95, F1Surkhan142 x Gulobi, F1Taramata x Volgogradsky/95, F1Taramata x Surkhan 142, F1L-31 x Surkhan142, F1L-31 x Sevara, F1MJ-46 x Surkhan 142, F1L-62 x Taramata, F1Sugdiyona x Surkhan 142, F1Sugdiyona x Volgogradskiy5/95, F1MJ-46 x Surkhan 142 hybrids of the first generation (F1) were studied in terms of transportability, resistance to the blight nematode, compared to the parental forms and the comparative G'1Nurafshan hybrid.

## 2. Materials and methods

Studies "Metodicheskie ukazaniya po izucheniyu i podderjaniyu mirovoy kollektsii ovoshchnyx paslenovyx kultur (tomaty, pertsy, eggplant)". (L., 1977), "Methodicheskie ukazaniya po selektsii sortov i hibridov tomato dlya otkrytogo i zashchishchennogo ground". (M., 1986) and carried out in accordance with OST 4671-78 (Phase II).

Experience is non-refundable. The plot area is 6.3 m2, the number of plants is 20, the plot is 2 rows. Planting scheme 210: 2 x 30 cm.

The seeds were sown under the film on the 1st day of February. Seedlings were planted in the open field on the 1st day of April.

## 3. Results and Discussion

Experience is non-refundable. The plot area is 6.3 m2, the number of plants is 20, the plot is 2 rows. Planting scheme 210: 2 x 30 cm.

The seeds were sown under the film on the 1st day of February. Seedlings were planted in the open field on the 1st day of April.

As can be seen from Table 1, the shortest period of action was observed in F1Taramata x Sevara and F1L-31 x Sevara hybrids obtained with Sevara variety and it was 104-105 days, and the early parent form ripened 2-3 days earlier than Sevara variety. These hybrids are precocious. In the remaining hybrids, the period of validity was 113-118 days, which are considered average.

Plant type Surkhan 142, Volgogradskiy 5/95, Taramata, Sevara, Sugdiyona, L-31 varieties are stocky, and they are a valuable starting source for creating stocky varieties. When the cross-breeding was carried out in a stem x stem pattern, the plant was a stem type in the first generation hybrids. When the hybridization was carried out in the standard x simple scheme, in the hybrids of the first generation, the plant was of the simple type.

The height of the plant is 43-80 cm in the parent forms, and we divided the hybrids obtained from them into three groups. The first group includes hybrids with a plant height of 51-77 cm: L-31 x Sevara, L-62 x Taramata, MJ-46 x Surkhan 142 and L-31 x Surkhan 142; the second group includes hybrids with a height of 85-92 cm: Namuna x Uzmash, Taramata x Surkhan 142, Taramata x Volgogradsky 5/95, Sugdiyona x Surkhan 142 and Sugdiyona x Volgogradsky 5/95; the third group included hybrids with a plant height of 102-115 cm: Surkhan 142 x Taramata, Surkhan 142 x Gulobi and Surkhan 142 x Volgogradsky 5/95.

The weight of the fruit was greater than the parental forms in the varieties Namuna, Surkhan 142, MJ-46, Volgogradsky 5/95, Taramata and Gulobi, their weight was 120-142 g. In the remaining varieties, the fruit was of medium size and weighed around 80-105 g. In many hybrids, the fruits were large and weighed 110-132 g. Only Taramata x Sevara, Sugdiyona x Volgogradskiy 5/95, L-31 x Sevara hybrids had average fruit weight of 95-100 g.

When the fruits of one of the parent forms were hard, the fruit became hard in the first generation hybrids, such hybrids include the following Surkhan 142 x Taramata, Taramata x Surkhan 142, Taramata x Volgogradsky 5/95, Sugdiyona x Surkhan 142, Sugdiyona x Volgogradsky 5/95, L- 31 x Surkhan 142, L-31 x Sevara and MJ-46 x Surkhan 142 belonged.

It was observed that when the fruit of both varieties participating in the crossbreeding is soft, the fruit is soft in the hybrids.

The shape of the fruit is round in all hybrids, and their color is red or dark-red. Since the oval shape of the fruit and its pink color are recessive characters, these characters did not appear in the first generation.

**Table 1.** Economic and morphobiological description of tomato hybrids of the first generation (F'1), 2018-2019.

| Hybrid and parental forms | Validity period, day | Plant | | Fruit | | | |
|---|---|---|---|---|---|---|---|
| | | Type | Height, cm. | shape | color | weight, g. | score, вall |
| Namuna | 115 | simple | 75 | round | red | 130 | 2,5 |
| Surkhan 142 , st. | 116 | columnar | 83 | round | red | 133 | 2,5 |
| L-31 | 118 | columnar | 43 | round. | red | 105 | 4,5 |
| MJ-46 | 123 | simple | 65 | round | red | 142 | 4,5 |
| Sevara | 107 | columnar | 47 | round | pink | 85 | 2,5 |
| Volgogradsky 5/95 | 119 | simple | 80 | round | red | 125 | 3,5 |
| Taramata | 122 | columnar | 80 | oval shaped. | red | 120 | 4.5 |
| Sugdiana | 120 | columnar | 55 | columnar | red | 120 | 4,5 |
| Uzmash-1 | 114 | simple | 70 | simpl | red | 80 | 5,0 |
| Gulobi | 115 | simple | 65 | round | pink | 120 | 2,0 |
| F$_1$Nurafschon st. | 117 | simple | 85 | round | red | 92 | 4,5 |
| Surkhan 142 x Taramata | 113 | columnar | 103 | round | red | 115 | 4,0 |
| Surkhan 142 x Volgogradsky 5/95 | 115 | columnar | 115 | round | red | 135 | 2,5 |
| Surkhan 142 x Gulobi | 116 | columnar | columnar | round | red | 110 | 2,5 |
| Taramata x Surkhan 142 | 119 | columnar | 85 | round | red | 125 | 4,0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Taramata x Volgogradsky 5/95 | 113 | columnar | 90 | round | red | 125 | 4,2 |
| Taramata x Sevara | 104 | columnar | 68 | round | red | 95 | 3,5 |
| Sugdiana x Surkhan 142 | 118 | columnar | 85 | round | red | 110 | 3,5 |
| Sugdiana x Volgogradsky 5/95 | 117 | columnar | 92 | round | red | 98 | 4,0 |
| Л-62 x Taramata | 115 | Simple | 68 | round | red | 115 | 4,5 |
| L-31 x Surkhan 142 | 118 | columnar | 72 | round | red | 110 | 4,0 |
| L-31 x Sevara | 105 | columnar | 51 | round | red | 107 | 3,0 |
| MJ-46 x Surkhan 142 | 118 | Simple | 77 | round | red | 132 | 4,0 |

As can be seen from Table 2, the yield of parent forms involved in crossbreeding was around 21.4-47.8 t/ha. The highest productivity was observed in varieties Surkhan 142, L-31, MJ-46, Sugdiyona (40.3-47.8 t/ha). The productivity of the first generation hybrids was different and made 39.8-70.2 t/ha. The highest productivity was observed in hybrids Surkhan 142 x Taramata, Taramata x Volgogradsky 5/95, Surkhan 142 x Volgogradsky 5/95 Sugdiyona x Volgogradsky 5/95, L-31 x Surkhan 142 (50.1-70.2 t/ha).

In terms of total yield, the highest heterosis effect was shown in hybrids Surkhan 142 x Taramata, Surkhan 142 x Volgogradsky 5/95, Taramata x Volgogradsky 5/95, L-31 x Surkhan 142 and it was 33.7-74.2% and these are heterozygous hybrids. Although not high, the effect of heterosis on total yield was also observed in the following hybrids Surkhan142 x Gulobi, MJ-46 x Surkhan 142, L-31 x Sevara and Sugdiyona x Volgogradsky 5/95 and it was 13.1-21.3%.

**Table 2.** Yield and heterosis effect of tomato first generation (F$_1$) hybrids, 2018-2020.

| | Hybrid and parent forms | General harvest, t/ha | Heterosis. efficiency, % | Productive yield, % | Early talker harvest, t/ha | Heterosis efficiency, % |
|---|---|---|---|---|---|---|
| | Namuna | 39,5 | 100 | 86,1 | 23,5 | |
| | Surkhan 142 , st. | 40,3 | 100 | 85,0 | 25,1 | |
| | L-31 | 43,0 | 100 | 94,6 | 29,4 | |
| 4 | MJ-46 | 47,8 | 100 | 95,5 | 21,1 | |
| 5 | Sevara | 33,5 | 100 | 89,5 | 32,0 | |
| 6 | Volgogradsky 5/95 | 35,5 | 100 | 81,1 | 19,5 | |
| 7 | Taramata | 39,8 | 100 | 97,0 | 23,1 | |
| 8 | Sugdiana | 41,3 | 100 | 96,2 | 27,1 | |
| 9 | Uzmash-1 | 21,4 | 100 | 96,0 | 33,0 | |
| 10 | Gulobi | 34,9 | 100 | 78,1 | 31,7 | |
| 11 | $F_1$Nurafschon st. | 55,8 | 141,3 | 96,0 | 33,4 | 142,1 |
| 12 | Surkhan 142 x Taramata | 70,2 | 174,2 | 98,3 | 29,0 | 115,5 |
| 13 | Surkhan 142 x Volgogradsky 5/95 | 61,3 | 152,1 | 95,1 | 23,0 | 91,6 |
| 14 | Surkhan 142 x Gulobi | 45.6 | 113,1 | 89.2 | 26.9 | 107,2 |
| 15 | Taramata x Surkhan 142 | 39.9 | 99,0 | 91.2 | 19,5 | 77,7 |
| 16 | Taramata x Volgogradsky 5/95 | 64,5 | 162,0 | 95,6 | 28,4 | 122,9 |
| 17 | Taramata x Sevara | 39,8 | 100 | 89.5 | 28,9 | 90,3 |
| 18 | Sugdiana x Surkhan 142 | 45,9 | 111,1 | 92.3 | 18,8 | 69,4 |
| 19 | Sugdiana x Volgogradsky 5/95 | 50.1 | 121,3 | 96,0 | 19,6 | 72,3 |
| 20 | Л-62 x Taramata | 44.2 | 111,0 | 97.6 | 22,0 | 95,2 |
| 21 | L-31 x Surkhan 142 | 57,5 | 133,7 | 93,5 | 31,6 | 107,4 |
| 22 | L-31 x Sevara | 51,6 | 120,0 | 92,5 | 32,5 | 82,3 |
| 23 | MJ-46 x Surkhan 142 | 49,5 | 116,6 | 93,2 | 30,1 | 115,3 |

The highest rate of early yield was observed in varieties Sevara, Uzmash, Gulobi and L-31 from parent forms, it was 29.4-33.0 t/ha, and these are early. A high rate of this sign was observed in the hybrids Namuna x Uzmash, Surkhan 142 x Taramata, Taramata x Volgogradsky 5/95, Taramata x Sevara, L-31 x Surkhan 142, L-31 x Sevara, MJ-46 x Surkhan 142, and it was 28, It was 4-33.4 t/ha.

The highest effect of heterosis on early yield was observed in hybrids Taramata x Volgogradsky 5/95, Surkhan 142 x Taramata, MJ-46 x Surkhan 142 (15.3-23.0%).

Marketable yield was significantly higher in firm, transportable varieties. The marketable yield was also high in the hybrids whose fruits were obtained in the presence of hard varieties.

## Conclusion

Thus, in 2018-2019, as a result of the study of the first generation hybrids, Surkhan 142 x Taramata, Taramata x Volgogradsky 5/95, Surkhan 142 x Volgogradsky 5/95 and L-31 x Surkhan 142 hybrids with the highest overall and early yield were selected.

Surkhan 142 x Taramata, Taramata x Volgogradsky 5/95, Surkhan142 x Volgogradsky 5/95 and L-31 x Surkhan 142 hybrids with the highest heterosis efficiency (33.7-74.2%) were separated.

The hybrids Taramata x Volgogradsky 5/95, Surkhan 142 x Taramata and MJ-46 x Surkhan 142 (15.3-23.0%) were distinguished with the highest heterosis efficiency in terms of early yield.

These hybrids are also notable for their resistance to the tuber nematode. These hybrids can be recommended for production after certain trials and are a valuable starting source for the development of better resistant cultivars and hybrids with valuable economic traits.

## References

[1] Juchenko A.A., Selection of plants (ekologo-geneticheskie aspekty), - Chisinau, 1986 p, - 34s

[2] Juchenko A.A. Adaptivnaya selektsiya rasteniy//Selektsiya produktivnyx sortov.-M., "Znanie", 1986a. - P.4-30.

[3] Nadjiev J.N., Aramov M.Kh., Boriev K.Sh. Manifestation of adaptive ability in tomato G'1 hybrids Scientific-practical magazine "Agrochemical protection and plant quarantine" - Tashkent, 2019.-№6.-81-84 p. ISSN 2181-8150

[4] Metodicheskie ukazaniya po izucheniyu i podderjaniyu mirovoy kollektsii ovoshchnykh paslenovykh kultur (tomatoes, pertsy, eggplants) - L., 1977. - 23 p.

[5] Methodological instructions for sorting and hybrid tomatoes for outdoor and outdoor soil. - M., VNIISSOK, 1986. -113 p.

[6]. OST 4671-78 Delyanki scheme planting and selection, sortoispytanii and primary seminovodstve ovoshchnyx culture. // Parameter. -M., VNIISSOK, 1997.