Selection of greenhouse hybrids of melon in the Republic of Uzbekistan

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Abstract: To date, not a single local variety of melon for protected ground has been zoned in our republic. In this regard, we conducted research to create hybrids of melon for protected ground. Several promising melon lines were selected from foreign and local selection (open ground). Subsequently, hybrid combinations were created. In the hybrid nursery, several promising local hybrids of melon were studied in comparison with the Kichkintoy standard. In 2022, the first variety of melon for protected ground was created for the first time, which was transferred to the State Agency for Variety Testing under the name Zarkhal. At present, we have created several hybrid combinations of greenhouse melons F1 Zarhal×L-22-17, F1 Zarhal×L-22-20, F1 L-160×L-179, F1 L-161×L-179, which are distinguished not only by the yield of 8-10 kg/m^2, but also by high taste qualities with an average weight of 0.8-1.5 kilograms, resistance to diseases (powdery mildew, fusarium wilt) - the tasting score of which was 4.8-5.0 points.

1 Introduction

Relevance Uzbekistan is one of the leading countries in the production of melons, especially valuable varieties of melons, famous for their taste not only in our republic, but also far beyond its borders - in European and Asian countries [1-7].

Melon is widely distributed in protected soil in France, Italy, Spain, Hungary, Bulgaria, the USA and Japan, Holland. Even in such warm countries as Israel, Egypt, Morocco, etc., growing melon in film greenhouses in winter is becoming increasingly important [4; 5]

The nutritional value of melon is that the pulp of the fruit contains 12-18% sugars, as well as vitamins - B, C, group B1, B2, A, PP and salts of potassium, calcium, magnesium, phosphorus and iron, etc.

According to the recommendations of the Institute of Nutrition, the consumption rate of melon crops is 30 kg per person per year, of which 25% (7.5-8.6 kg) falls on melon, but the distribution of its consumption is very uneven across the zones of the country and can reach up to 60 kg in cultivation zones.

Currently, dozens of melon varieties for closed ground have been created and zoned in countries of the near and far abroad.

Despite this, unfortunately, until recently, no work has been carried out in our republic on the selection of melons in protected ground.

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In this regard, starting in 2020, selection work began to create greenhouse melons in film greenhouses.

2 Place and conditions of the research

The research was conducted at the Research Institute of Vegetable, Melon crops and Potato, located in Tashkent district, Tashkent region, 3 km west of Tashkent.

Tashkent region is located in the north-eastern part of Uzbekistan, occupying the territory between 42°17″ and 40°15″ north latitude and 68°39″ and 71°02″ east longitude.

Climate. A characteristic feature of the climate of Uzbekistan is the abundance of light and heat. In the Tashkent region, the duration of sunshine is on average 2700-2900 hours per year. In summer, the number of hours of sunshine reaches 360-400 hours per month, in winter this number is 95-110 hours.

The Tashkent suburban area, where the Research Institute of Vegetables, Melons and Potatoes is located, is characterized by the following climatic conditions.

The average daily air temperature during the years of research was slightly higher than the long-term average (Fig. 1).

In 2022, March was characterized by a lower temperature for this period + 8 ° C compared to the average long-term data of 4.8 ° C. The graph shows that the air temperature for the period from 2022 from March to September was lower compared to the average long-term data.

The amount of precipitation during the years of research also differed slightly from the average long-term data. The least rainy and snowy winter, as well as the warmest spring, was in 2022, when precipitation was 2 times less than the average long-term data. During the research period, the summer was very hot and dry. From June to September, there was almost no precipitation, it resumed only after October.[5]

Soils. The soils of the experimental plot are typical gray soils of long-standing irrigation with a deep groundwater level (12-13 m). According to the mechanical composition, the soils of the experimental plot are classified as dark loam of medium compaction. Agrochemical data from experimental greenhouses showed that the organic matter content before planting in 2022 was -15.6%, while the nitrogen content was 16.3 mg / 100 g of soil, the phosphorus content was 4.9 mg / 100 g of soil, the potassium content was 49.0 mg / 100 g of soil, magnesium was 42.0 mg / 100 g of soil, calcium was 61.0 mg / 100 g of soil. The content of water-soluble salts in the main area of the greenhouses was at the level of 0.460%, the chlorine content was 0.046% [5].

3 Growing seedlings

The technology for growing melon seedlings is similar to the technology for growing cucumber seedlings. Before the emergence of seedlings, the substrate temperature should preferably be maintained at 28-30 ℃, after emergence, it should be reduced to 20-25 ℃. The air temperature during the day was 23-25℃, 20-21 ℃ at night.

The sowing period for seedlings for the preparation of spring turnover was February 1-5, planting in a permanent place in early March.

The seedlings were grown in plastic cassettes with a nutrient mixture (humus, soil, peat) 1:1:1. [1; 5]

The application of mineral fertilizers before planting seedlings and during the growing season was carried out based on the results of an agrochemical analysis of the soil.

Fig. 1. Preparation of melon seedlings in the seedling department

4 Research results

Seedlings are planted at the age of 20-25 days; when overgrown seedlings are planted (more than 30-35 days), the yield is significantly reduced. Seedlings are planted without deepening the root collar, since the hypocotyl is susceptible to fungal diseases [5].

The planting pattern depends on the growth strength of the plants, formation, agricultural technology, environmental conditions and other factors. Thickened planting leads to a decrease in the size of the fruits and a decrease in the sugar content in them. With thickened planting, intensive growth of the main stem in height is observed, regardless of the method of formation (into one or two stems) [5].

In our experiments, melon plants were formed into one stem, in which only the main stem was tied vertically and the lateral shoots were pinched.

The female flower (i.e. the fruit-bearing flower) is located in the first nodes of the lateral shoot, so if the lateral shoots are not pinched above the ovary, the plants often shed the female flowers, for which it is necessary to pinch the lateral shoots by one leaf, short pinching, or leave two or three leaves above the ovary (long pinching).

Fig. 2. Crop accounting

Zarkhal belongs to the mid-early group, ripens on the 75th - 80th day from mass shoots, the plants are powerful, the leaves are dark green, the average fruit weight is 0.8 - 1.2 kg, shiny lemon color, with shallow green stripes, the pulp is 3.5 -4.0 cm thick, soft, juicy.

Contains PCB (soluble dry matter) up to 12.4%, resistant to powdery mildew. Yield 8.0 - 8.2 kg / m2. Tasting score 4.5 points.

Creation of heterotic hybrids is a promising direction in melon breeding in closed ground. The more the parental forms differ from each other in environmental conditions of cultivation, early maturity, origin, morphological and other characteristics, the more pronounced is heterosis [5; 6; 7]

In the 2022 experiments, we studied 20 melon lines of foreign and local selection, created over 30 hybrid combinations, but the following varieties turned out to be the most interesting in terms of yield, taste and commercial qualities, as well as disease resistance: Zarkhal, F1 L-160 × L-179, F1 L-161 × L-179, F1 Zarkhal × L-22-17, F1 Zarkhal × L-22-20 in comparison with the Kichkinta standard. Due to the fact that there is no zoned variety in closed ground in the republic, we were forced to take the small-fruited zoned melon variety from open ground Kichkinta as the standard. The accounting area is 10 m2, the planting pattern is , the culture was carried out in one stem with a garter to the trellis with twine. During the growing season, phenological observations, biometric measurements, crop accounting with recalculation of the crop per 1 m2 were carried out, during the period of mass harvesting, a biochemical analysis of fresh melon fruits was carried out, weekly accounting for plant resistance to diseases common in protected soil (powdery mildew, fusarium wilt) together with phytopathologist Kholdarov M.U., from the plant protection laboratory.

In order to track the growth and development of vegetative organs in melon varieties, we carried out a biometric analysis (Table 1).

The power of plant development was characterized by the following indicators: the length of the main stem, the number of shoots, the number of leaves on one plant.

Table 1. Biometric measurements during the period of mass ripening in melon varieties (2022)

№	Variety samples	Height of the main stem (см)	Number of lateral branches (pieces)	Number of leaves (pieces)
St	Kichkintoy	160,5	4	31
1	Zarkhal	180,4	4	34
2	F_1 L-160× L-179	200,1	4	36
3	F_1 L-161× L-179	211,8	4	37
4	F_1 Zarkhal × L-22-17	215,4	4	37
5	F_1 Zarkhal × L-22-20	225,8	4	38

When measuring the vegetative organs of melon plants, the following were distinguished: F1 Zarhal × L-22-20 - 225.8 cm, 4 lateral branches and 38 leaves, the smallest was noted in Zarhal 180.4 cm, 4 lateral branches and 34 leaves, in the standard Kichkintoy, respectively - 160.5 cm, 4 lateral branches and 31 leaves, in the remaining samples these indicators were intermediate. A large number of leaves is a positive sign, they contribute to the improvement of carbon nutrition of plants and photosynthesis, which contributes to a better process of fruit formation and increased productivity (Table 2).

Table 2. Yield and its quality in greenhouse melon varieties in spring turnover (2022)

№	Variety samples	The harvest is marketable		K % St	Average fruit weight kg.	Soluble dry, substances %	Tasting score, points
		kg/м^2	%				
St	Kichkintoy	6,6	94	100	0,680	10,4	4,0
1	Zarkhal	8,2	96	124	0,825	12,4	4,5
2	F_1 L-160× L-179	9,5	96	144	0,790	12,7	4,5
3	F_1 L-161× L-179	9,0	95	136	0,850	13,1	4,7
4	F_1 Zarkhal × L-22-17	10,1	96	153	0,715	13,4	4,8
5	F_1 Zarkhal × L-22-20	10,6	96	161	1,150	14,3	5,0

As can be seen from the table, 4 new hybrid combinations are very promising in terms of yield. It is very important to get not only a high yield but also a quality one. The average weight of melon fruits for all varieties varied from 0.715 to 1.150 kg. According to the content of soluble dry substances (determined by a refractometer), F1 Zarhal × L-22-20 stood out - 14.3%, F1 Zarhal × L-22-17 - 13.4%, F1 L-161×L-179 - 13.1%, the lowest was noted in Kichkintoy - 10.4%. During the period of mass collections, we conducted a tasting assessment of melon fruits on a 5-point system. All 5 new melon varieties stood out in terms of taste and appearance: Zarkhal, F1 L-160×L-179, F1 L-161×L-179, F1 Zarkhal × L-22-17, F1Zarkhal × L-22-20, the tasting score of which was 4.5 - 5.0 points, the Kichkintoy standard - 4 points. Table 3 provides a description of the economically valuable traits of the new greenhouse melon varieties.

Table 3. Economically valuable traits in melon varieties in film greenhouses (2022)

№	Variety samples	Fruit characteristics				pulp structure	Disease prevalence, %	
		length and width cm	pulp thickness cm	pulp color	pulp structure		powdery mildew	fusarium
St	Kichkintoy	12x10	2,8	light green	soft	0,680	20	20
1	Zarkhal	14x12	3,5	white	soft	0,825	0	10
2	F_1 L-160× L-179	13x12	3,2	white	soft	0,790	0	10
3	F_1 L-161× L-179	14x13	3,5	white	soft	0,850	0	10
4	F_1 Zarkhal × L-22-17	12x11	3,0	white	soft	0,715	0	5
5	F_1 Zarkhal × L-22-20	18x14	4,1	white	soft	1,150	0	0

As can be seen from Table 3, the flesh of the greenhouse melon was white, soft, the thickness of the flesh varied from 3.2-4.1 cm. All samples were resistant to powdery mildew, the hybrid F1 Zarhal x L-22-20 was also resistant to fusarium, the remaining samples were affected by fusarium by 5-10%, the open ground variety Kichkintoy was affected by powdery mildew and fusarium up to 20%.

An important indicator of the prospects of any variety or hybrid is their resistance to diseases, the most common in the melon crop - powdery mildew and fusarium wilt.

5 Conclusions

1. New local varieties Zarhal, F1 L-160×L-179, F1 L-161×L-179, F1 Zarhal × L-22-17, F1Zarhal × L-22-20 stood out in productivity, appearance and taste and are resistant to powdery mildew and fusarium wilt, are very promising for growing them in closed ground,

2. At present, hybrids F1 L-160×L-179, F1 L-161×L-179, F1 Zarhal × L-22-17, F1Zarhal × L-22-20 are undergoing environmental testing in the regions: Tashkent, Syrdarya, Samarkand, Bukhara, Andijan and Kashkadarya.

3. In 2024, hybrids F1 L-160×L-179, F1 L-161×L-179, F1 Zarhal × L-22-17, F1 Zarhal × L-22-20 these samples will be transferred to the State Patent Agency.

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