Advanced Studies in Biology, Vol. 16, 2024, no. 1, 63 - 71
HIKARI Ltd, www.m-hikari.com
https://doi.org/10.12988/asb.2024.91867

The Comparative Biomorphological and Biochemical Characterization of the Perspective Melon Sorts with High Nutritional Value

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Abstract

In the article, in 2022-2023, the information on the comparative biomorphological and biochemical characteristics of the perspective melon sorts - Gunash, Sadaf, Khurshud and Kapraba grown on the gray-brown soils of the Absheron Auxiliary Experimental Farm of the "Vegetable Scientific Research Institute" public legal entity is presented. The research was conducted in two phases - 20 days before technical maturity and in the phases of technical maturity. As a result of the research, it was determined that in the phase of technical ripeness, the length of fruits increases by 1.10-1.20 times, the diameter 1.17-1.38 times, the wet mass of a fruit 1.55-2.22 times, and the dry mass 1.96-3.40 times. At this time, the largest increasing was noted in the Khurshud sort, and the least increasing in the Gunash sort. It has been shown that in the studied perspective sorts, as the diameter of the fruits grows more than their length, so the value of the fruit index decreased in almost all samples.

In contrast to the green products, in technically ripened fruits, the amount of the sugar, extractive substances, dry substance and toxic substances - nitrates is noted in the Khurshud sort (respectively 12.17%, 13.18% and 166.8 mg/kg), and the least in the Gunash sort (7.0 %, 8.20 %, 8.30 and 117.1 mg/kg, respectively). The remaining two perspective sorts, Sadaf and Kahraba, have an intermediate position in

this respect. They contained 8.68 and 10.60% of dry matter, 7.70 and 9.10% of sugars, 8.57 and 10.24% of extractives, and 119.2 and 165 mg/kg of nitrates. It was determined that, each of the 4 studied perspective melon sorts is important according to the nutritional value, among them, Khurshud and Kahraba are superior from other samples according to this indicator.

Keywords: melon, perspective sorts, biomorphological indicators, biochemical content, dry mass, technical maturity phase

Introduction

Melon is an annual plant belonging to the genus Cucumus of the Cucurbits family. The trunk is creeping, the leaves are large and long-stalked. The mass of the melon fruit is from 200 g to 16 kg (sometimes even more) depending on the sort. It yields 300-400 c/ha in the irrigated fields, and up to 200 c in dry conditions [1]. The melon is special due to its chemical composition, usefulness for the human body, therapeutic and preventive properties, among the vegetable plants. The benefit of the melon depends entirely on its chemical composition. It consists of 90% water and many vitamins (E, PP, A, C, B_1, B_2, B_5, B_9), microelements (iron, silica, zinc, iodine, copper, fluorine, cobalt, etc.), mono and dicharides, organic acids, saturated and unsaturated fatty acids, food fibers (cellulose) [4, 11]. The melon is considered an irreplaceable product in the nutrition of a person to having such a chemical composition. The elements contained in the melon have a beneficial effect on many organs of the human. They strengthen them, strengthen the nervous system, stimulate the digestion, improve the functioning of the digestive and cardiovascular systems, affect positively to the condition of the hair, clean the body of the slags, refresh the skin, make it soft and thin, strengthen the body, and the body becomes elastic and healthy [7].

The melon replenished with sugar, is an excellent source of energy, good for a person's mood, but due to this feature (high sugar content), melon is included in the list of undesirable products for diabetics.

The growth and development of the melon plant, like other vegetable plants, depends on the external environmental factors (the effect of light, water, temperature, drought, soil composition, etc.). It was determined that, in melon plantings, the water supply level affects significantly to their growth and development. More stronger developed plants were obtained with an 18% increase in total water demand during the vegetation season and achieved 25-30% increase in productivity [Kolebashina et al, 2019]. Also, during the period of formation and ripening of the fruits, water demand increased and it was achieved to the increasing of the bush by 17.2%, leaf surface area by 20.7%, and total mass of the plant by 17.5%. The total water demand

was 2300 m3/ha, the root system mass was 1795 m^3/ha and was 6.6% more compared to water supply [10]. At the level of increased water availability, the main root mass is located 1-3 cm deeper, it allows the plants to better use the available moisture when the top layer of the soil dries.

The melon grows poorly in salted and saline soils, the melon plant dies when the concentration of salts in the soil layer is 0.5-0.7%, including 0.5-0.7% chlorine salts [3].

During the vegetation period, the demand for heat of melon is determined by the sum of the average daily temperature exceeding 15^0C and is 2500-3000^{0}C, this demand varies depending on the characteristics of the sort. The melon plant is able to withstand the high temperature of the environment up to 43^0C and the soil up to 63^0C, that is, this plant is selected out for its resistance to drought [2, 12, 14].

The melon plant is very resistant to organic and mineral fertilizers. 15 t of manure, 50 kg of ammonium salt, 150-200 kg of superphosphate, and 150 kg of potassium fertilizer were given to the fields planted with melons and it increases the yield and ensures obtaining a high-quality melon product [1, 9-10].

Materials and methods

The purpose of the research: to study the biochemical composition of the fruits of the melon varieties created in the public legal entity of "Scientific Research Institute of Vegetables" and presented to the State Commission on the Testing and Protection of Selection Achievements in a comparative manner.

The object and methodology of the research. The object of the research was 4 sorts of melon grown in the open field (Khurshud, Sadaf, Gunash and Kahraba). The experiments were carried out with the general methodology adopted for vegetable-melon plants in the gray-gonut soils of the Absheron zone [13]. The biochemical composition of melon berries were studied in different maturity phases - 20 days before technical maturity and their comparison were carried out.

The amount of the total sugars in the fruits was determined using the RA-130 refractometer (Korea), the amount of the extractive substances was determined using the RX-5000 CX device (ATAQO-Japan), and the amount of the nitrates was determined using the Nitratometer (SOEKS) portable device. The dry matter of the fruits was determined by heating at 105^0C using the thermostar-weight method [15].

The newly created prospective varieties are designed for cultivation both in small-scale personal auxiliary farms and in large-scale farms. The fruits are easily separated from the pods, can be transported with little loss, can maintain their quality for a long time, and are relatively resistant to the diseases common in the region.

The research results and their discussion. A brief biomorphological characterization of the newly created promising cultivars is as follows.

Catalog number in **Gunash**-VSRI is 80. As a result of the hybridization of Yerli Shahnisa variety of Azerbaijani origin with PMR-45 A variety of American origin, hybrid generations were purchased, evaluated and created by the method of individual selection of the most favorable forms. The variety is medium early growing. The number of the days from mass germination to the beginning of full ripening of the fruits is 70-75 days. Vegetation period (from mass output to last harvest) is 98 days.

The variety requires lightly aerated soils rich in organic compounds, nutrients, high agrotechnical care, is very sensitive to light, sun and heat. The length of the main arch reaches 235.0-245.0 cm. The length of the leaf blade is 11.1-13.1 cm, the width is 13.6-16.3 cm, the color is green. The fruit is ovoid. The length of the fruit is 20.5-30.7 cm, the diameter is 15.7-12.5 cm. The mass of the commercial fruit is 3.9-4.6 kg. The surface is smooth, with fine mesh. Its color is dark yellow. The thickness of the shell is medium, the color of the bark is light orange, the bark is thick, the shell is folding.

The variety is resistant to fusarium and downy mildew, is productive in extreme conditions, and has good fruit quality.

The catalog number 81 in **Sadaf**- VSRI. The variety was obtained by individual selection method from Yerli Karim and Yokneam 56 hybrid of French origin (4x36). The variety is late maturing. The number of the days from mass germination to the beginning of fruit ripening is 87-90 days. The vegetation period (from mass output to last harvest) is 116 days.

The length of the main arch is 230.0-250.0 cm. The length of the leaf blade is 10.5-13.4 cm, the width is 13.7-16.3 cm, the color is light green.

The fruit is round and flat. The length of the fruit is 12.0-15.0 cm, the diameter is 14.2-17.1 cm. The mass of the commercial fruit is 1.4-1.8 kg. The surface is slightly segmented, slightly coarsely meshed and yellow in color. The thickness of the shell is medium, the color is light yellow, the lath is thick, the color of the lath is light yellow, and the shell is folding.

The variety is resistant to fusarium wilt and downy mildew, is productive in extreme conditions, and has good fruit quality.

The catalog number 84 in **Khurshud**-VSRI. The variety was obtained by hybridization from local Absheron 3 of Azerbaijani origin and PMR 45 of foreign American origin, created by individual selection method. The variety is late maturing. The number of the days from mass germination to the beginning of fruit ripening is 94-96 days. The vegetation period (from mass output to the last harvest) is 112 days.

The length of the main arch is 250.0-265.0 cm. The length of the leaf blade is 11.8-13.2 cm, the width varies between 14.3-16.9 cm, the color is dark green. The fruit is oblong-oval. The length of the fruit reaches 18.3-24.8 cm, the diameter reaches 14.7-16.3 cm. The mass of the commercial fruit is 2.6-3.2 kg. The surface is smooth, with fine and rough reticulation, greenish-yellow color. The thickness of the

shell is medium, the color of the bark is greenish-yellow, the bark is thick, the shell is folding.

The variety is resistant to Fusarium wilt and downy mildew, its productivity does not decrease sharply under extreme conditions, and its fruits are distinguished by their quality.

Kahraba- VSRI catalog number 85. The variety was obtained by hybridization of local Absheron 4 and Foreign PMR 45 A variety of American origin. The variety is late maturing. The number of the days from mass germination to the beginning of fruit ripening is 93-95 days. The vegetation period (from mass output to the last harvest) is 115 days.

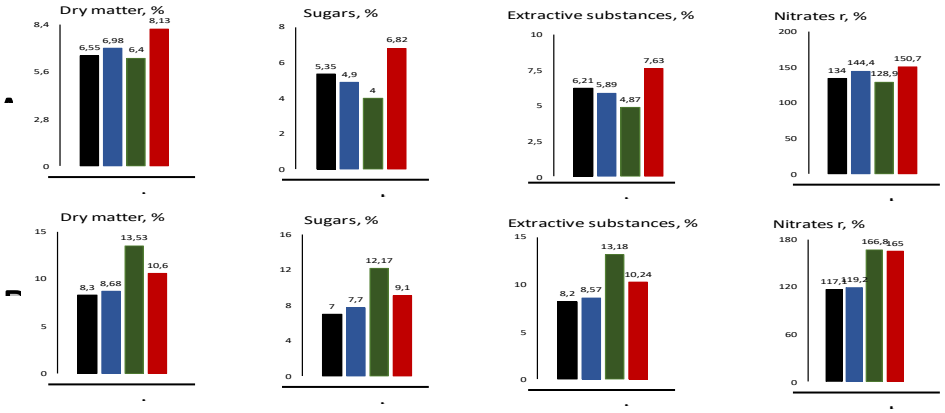
The length of the main arch reaches 235.0-250.0 cm. The length of the leaf blade is 10.3-13.1 cm, the width is 13.2-15.8 cm, the color is green. The fruit is oblong-ovoid. The length of the fruit reaches 24.1-29.7 cm, the diameter reaches 13.7-18.4 cm. The mass of the commercial fruit varies between 3.0-3.5 kg. The surface is smooth, with fine and rough reticulation, greenish-yellow color. The thickness of the peel is medium, the color of the cut is light green with streaks, the blade is thick, the color of the blade is orange, the shell is folding.

The variety is distinguished by the high quality of its fruits, it is productive in extreme conditions, it is resistant to fusarium disease and downy mildew.

A comparative study of the biochemical composition of the fruits at different stages of the maturity showed that green, unformed fruits with the highest amount of dry matter, sugars, extractive substances and nitrates (respectively 8.13%, 6.82%, 7.69% and 150, 7 mg/kg) Kahraba variety was distinguished. The lowest amount of studied biochemical parameters was noted in Khurshud variety (6.40 %, 4.0 %, 4.84 % and 128.9 mg/kg, respectively) [figure]. The remaining two varieties - 80 and 81 have an intermediate position according to both their biomorphological and biochemical indicators.

In the samples studied in the phase of technical maturity, there was a serious change in both biometric and biochemical indicators. Thus, the length of all fruits increased by 1.10-1.20 times, and the diameter by 1.17-1.38 times, and the fruit index changed between 0.89-1.44. Compared to green fruits, the mass increase in technically ripe fruits was 1.55-2.22 times. At this time, the largest mass increase (2.22 times) was observed in the Khurshud variety, and the least increase was observed in the Gunash variety (1.55 times) (table).

As the biometric indicators, an increase in the amount of sugars, extractives and dry matter was noted in all samples. However, although an increase in the amount of the nitrates was observed in Khurshud and Kahraba varieties, its amount decreased in Gunash and Sadaf varieties. In contrast to green fruits, the content of sugars, extractive substances and nitrates in technical ripened fruits is the highest in the Khurshud variety (12.17%, 13.18%, 13.53% and 166.8 mg/kg, respectively), and the least in the Gunash variety. (7.0%, 8.20%, 8.30% and 117.1 mg/kg, respectively). As can be seen from the data shown in the picture, the amount of the dry matter in



Picture. The comparative assessment of the biochemical composition of the fruits of different varieties of melon in different stages of the maturity
A – 20 days before technical maturity; B – technical maturity phase. a – 80- Gunash; b – 81-Sadaf; c – 84-Khurshud, ç – 85-Kahraba

Table. The comparative assessment of the perspective melon varieties in different maturity phases according to the biomorphological indicators (1-20 days before technical maturity and 2 in the phases of technical maturity)

Indicators	**80-Gunash**		**81-Sadaf**		**84-Khurshud**		**85-Kahraba**	
	1	**2**	**1**	**2**	**1**	**2**	**1**	**2**
The average mass of a fruit, g	1310.94	2031.52	202.29	376.34	967.48	2150.04	1198.12	2201.96
The change interval of the fruit masses (min-max)	1025.62-1538.80	1022.70-2993.95	190.43-214.67	234.79-606.51	801.98-1203.63	1532.46-3099.40	920.02-1586.90	1308.23-2960.8
Fruit length, mm	208.3	238.6	67.3	78.9	178.3	195.6	175.0	210.0
Fruit diameter, mm	120.0	166.0	75.7	88.9	106.1	143.4	124.8	156.7
Fruit index	1.74	1.44	0.89	0.89	1.68	1.36	1.40	1.34
The dry mass of the fruits, g	32.67	61.92	230.90	97.41	233.42	85.87	168.62	14.12

melon fruits, including the phase of technical ripeness, increased by 1.27-2.18 times, the amount of sugars by 1.33-3.04 times, and the amount of the extractive substances by 1.32-2.71 times. At this time, the greatest increase occurs in the Khurshud variety (2.11-3.04 times), and the least increase occurs in the Gunash variety (1.27-1.32 times). Such a picture is explained by the biological characteristics of the varieties.

It should be noted that the amount of the nitrates - toxic substances in both green and ripe fruits was 1.30-1.85 times higher than the permissible limit (90 mg/kg) determined by the Ministry of Health of the Republic of Azerbaijan for this melon product. However, the high amount of sugars, extractive substances (especially vitamin C) in the studied samples weakens the effect of these toxic substances, resulting in a balanced product with high nutritional value. Also, one point should be noted that if the fruits of Khurshud and Kahraba varieties are harvested a week later than Gunash and Sadaf varieties, in our opinion, the amount of the nitrates will decrease even more.

That is, the accumulation of the nitrates in melon fruits also depends on the harvesting period. The another factor for reducing nitrates is the application of mineral fertilizers (N, P_2O_5, K_2O) in a balanced manner (in the ratio of 0.5:1:1) [5, 8, 13].

Conclusion

Thus, during the evaluation of the perspective melon varieties (Khurshud, Sadaf, Gunash and Kahraba) cultivated in the gray-brown soils of Absheron in the open field in the period 20 days before the technical maturity and in the technical maturity phase, it was determined that the length of the fruits in the technical maturity phase is 1.10-1, 20 times, 1.17-1.38 times in diameter, 1.55-2.22 times in wet mass of a fruit, and 1.96-4.70 times in dry biomass.

At this time, the biggest growth was noted in Khurshud variety, and the least growth in Gunash variety. In contrast to the green fruits, the highest amount of sugars, extractive substances, dry matter and nitrates in technically ripe fruits is noted in Khurshud variety (respectively 12.17%, 13.18%, 13.53% and 166.8 mg/kg), the least and the amount is noted in the Gunash variety (7.0%, 8.20%, 8.30% and 117.1 mg/kg, respectively). The remaining two perspective varieties have an intermediate position in this regard.

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Received: June 3, 2024; Published: July 1, 2024