THE BEHAVIOR OF SOME MELON CULTIVARS (*CUCUMIS MELON*) ON THE SANDY SOILS FROM SCDCPN DĂBULENI

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Abstract

The study was carried out in an experimental plot in 2023 on the sandy soils of SCDCPN Dăbuleni, characterized by low natural fertility, having in the 0-20 cm soil layer an organic carbon content of 0.56% and a humus content of 0.96 %. Seven melon cultivars were studied in the experimental field, observing a great diversity of their morphological and biochemical characteristics.
Morphological characteristics such as fruit weight, fruit length and diameter, diameter of the seminal cavity, pulp thickness, and sugar content were determined for the analyzed fruits. Among the analyzed cultivars, stood out the AS 086 cultivar with an average fruit weight of 2.08 kg and the Traian cultivar with an average pulp thickness of 3.94 cm. Regarding the sugar content, the highest value was recorded for the cultivar AS 084, respectively 11.40%. From the point of view of the realized productions, the AS 038 cultivar stood out with a production of 29.07 t/ha, the lowest production being recorded for the AS 088 cultivar, respectively 22.33 t/ha.

Key words**: **melon, cultivar, physical charcaterisitcs, sandy soils, production

INTRODUCTION

Melon (*Cucumis melo* L.) belongs to the genus *Cucumis*, family *Cucurbitaceae*, and is an important horticultural species worldwide in both temperate and warm climates. *Cucumis melo* L. is considered one of the most diverse species of the genus, indicated by a great diversity of fruit characteristics such as shape, color, texture, taste, and composition (Stepansky et al., 1999).
Worldwide, melon occupies an important place, with a total annual production of 26.8 million tons, being cultivated on an area of 1.3 million hectares (FAO, 2007). *Cucumis melo* L. is a species that is cultivated for its fruits, which are consumed fresh at physiological maturity, being highly appreciated by consumers due to their special taste, juiciness, and aroma; being also rich in carbohydrates, proteins, vitamins (C, B1, B2, B6), carotene, mineral salts (Ca, P, K, Fe). Regarding the requirements of this species towards environmental factors, we can say that the melon is a thermophilic species with very high requirements for heat. Melon finds favorable conditions for development in arid areas (Drăghici et al., 2018; Ciuciuc, 2003; Cabello et al., 2009). Compared to soil and water, melon plants have lower requirements due to the structure of the root system, which gives the plant greater resistance to drought and better utilization of mineral elements (Drăghici et al., 2018; Costellanos et al., 2011; Ciuciuc, 2009).
Since the areas of agricultural land and the availability of water resources decrease, and the incidence of diseases and pests increases, it is essential to cultivate melon cultivars that are drought tolerant and resistant to the attack of pathogens (Drăghici et al., 2018; Panagiotopoulos, 2001; Rubaiyat Sharmin & Mahabubur

Rahman, 2014). In this regard, the present work aims to study and evaluate the behavior of some melon cultivars in order to obtain data on the adaptation of this species to the climatic conditions on the sandy soils of the Dăbuleni area.

MATERIALS AND METHODS

The experiment was established in 2023 and is located on the sandy soils of SCDCPN Dăbuleni, characterized by low natural fertility. The randomized block method was used for its establishment.

The plant material used to establish the experience was represented by 7 melon cultivars 'Dăbuleni 60', 'AS 038', 'AS 040', 'AS084', 'AS 086', 'AS 088' and 'Traian'.

The physical properties of the fruits, determined for 2023, were represented by the height and diameter of the fruits (cm), fruit weight (kg), and pulp thickness (cm), according to the methodology described by Ionică (2014), and the production of each cultivar was calculated related to the surface of one hectare (t/ha).

The soluble dry matter (SUS) was also determined by the refractometric method, the results being expressed in percentage (%).

The obtained data were processed statistically, using the statistical analysis program (StatPoint Technologies, Warrenton, VA, USA).

RESULTS AND DISCUSSIONS

Analyzing the data from Table 1 regarding the climatic conditions recorded in the experimental field during the melon vegetation period (April-August) we observe an increase in temperatures compared to the multi-year average.

Regarding the amount of precipitation that fell during this period, they recorded an amount of 316.70 mm, varying between 81.60 mm in May and 22.30 mm in August.

The results obtained by Simsek & Comlekcioglu in 2011 highlight that melon can be successfully cultivated in arid areas, where annual rainfall amounts vary between 314.31 mm and 364.20 mm.

In these conditions of thermo-hydric stress, choosing specific plants for cultivation in the area of sandy soils and finding solutions to balance the negative effects of this phenomenon, is a necessary measure in promoting agriculture in the area of sandy soils.

Abiotic factors including temperature, light, water, and nutrients can affect the development of physiological processes and fruit size (Katsumi et al., 1999). During the period of fruit formation, the high temperatures of 35°-40°C cause rapid ripening to the detriment of their quality.

Figure 1. Some of the studied melon cultivars

As a result of the soil analyses, according to the data in Table 2, the carbon content of the soil, at a depth of 0-20 cm, was found to be 0.56% and a value of 0.96% humus, and the pH recorded the value of 7.12

Table 1. Analysis of climatic conditions recorded at RDSPCS Dăbuleni in the vegetation period of *Cucumis melo*

Period / The climatic element		IV	V	VI	VII	VIII	Average (°C)	Σ (°C/mm)
2023 year	Monthly average temperature (°C)	11.1	16.8	21.2	25.4	25.4	19.98	99.9
	Monthly maximum (°C)	23.5	29	37.6	42	41.6	34.74	173.7
	Monthly minumum (°C)	0.00	7.40	11.40	10.20	10.60	7.92	39.60
	Rainfall (mm)	57.80	81.60	81.40	73.60	22.30	63.34	316.70
Multiannual climate data (1956-2023) mm	Monthly average temperature (°C)	11.68	16.47	21.54	23.32	22.70	19.14	95.72
	Monthly average precipitation (mm)	47.13	62.67	70.01	54.29	36.55	54.13	270.64

Σ- sum

Table 2. Analysis of sandy soil composition from experimental field of RDSPCS Dăbuleni

The variant	The depth (cm)	Nt (%)	Extractable phosphorus (ppm)	Exchangeable potassium (ppm)	Carbon organic (%)	Humus %	pH
Experimental field	0-20	0,07	20,8	76,8	0,56	0,96	7,12
	20-40	0,03	36,28	44,8	0,37	0,63	7,10
Fertility status		LOW	MEDIUM	LOW	LOW	LOW	NEUTRAL

Melon loves heat, needing an optimal soil temperature of 20°-25°C, for a normal development of the root system and a better absorption of water and mineral salts; being a species that prefers light soils, with a good structure and a pH between 6-7 (Toma et al., 2011).

Table 3 shows the results obtained regarding the main biometric characteristics of melon fruits. This year, the melon fruits showed an average height that varied between 21.40 cm for the cultivar 'AS 086' and 10.66 cm for the fruits of the 'Dăbuleni 60' cultivar. The diameter of the fruits showed an average value between 14.60 cm for 'AS 086' and 10.04 cm at 'Dăbuleni 60'. The results obtained regarding the height of melon fruits are higher than those reported by Can & Turkmen (2022) obtained for the studied cultivars, respectively 21.03 cm and 16.57 cm. Regarding the fruit diameter, Can & Turkmen (2022) reported higher values than those in the present study, respectively 14.83 cm and 13.79 cm.

An important characteristic analyzed in the melon fruits is their weight, which recorded the highest value of 2.08 kg for cultivar 'AS 086', with variation limits between 1.05 and 2.82 kg, and the lowest weight of 0.60 kg for the 'Dăbuleni 60' cultivar with variation limits between 0.33 and 0.81 kg.

In the literature, Can & Turkmen (2022) reported an average weight of melon fruits between 2.489-1.864 kg, higher than that reported by Szamosi et al., (2010) respectively 1.017 kg, the data obtained in the present study being in accordance with those reported by them.

The pulp thickness of the analyzed melon fruits varied between 3.04 cm for the 'Dăbuleni 60' cultivar and 3.94 cm for the fruits of the 'Traian' cultivar. The results obtained are consistent with those obtained by Aragao et al., 2013 who reported pulp thickness values between 2 and 5 cm.

Table 3 The morphological characteristics of melon fruits studied under the conditions of sandy soils in the southern part of Oltenia

Cultivar	Statistical analysis	Characteristics				
		Fruit weight (kg)	Fruit height (cm)	Fruit diameter (cm)	Pulp thickness (cm)	Brix %
'Dăbuleni 60'	Mean ± SD	0.60 ± 0.17	10.66 ±1.95	10.04 ± 1.51	3.04 ± 0.35	10.1 ± 1.24
	Variation Limits	0.33 - 0.81	8.5 - 13.30	8 - 11.50	2.5 - 3.40	8 - 11.00
	CV%	29.04	18.29	15.05	11.54	12.33
'AS 038'	Mean ± SD	1.37 ± 0.11	16.7 ± 1.30	13.28 ± 1.20	3.74 ± 0.25	6.40 ± 0.42
	Variation Limits	1.24 - 1.51	16.00 - 19.00	12.00 - 15.00	3.50 - 4.00	6.00 - 7.00
	CV%	8.33	7.81	9.07	6.71	6.54
'AS 040'	Mean ± SD	1.29 ± 0.24	14.54 ± 1.90	12.20 ± 1.48	3.54 ± 0.36	8.40 ± 0.42
	Variation Limits	0.87 - 1.46	12.00 - 16.00	10.00 - 14.00	3.00 - 4.00	8.00 - 9.00
	CV%	18.51	13.06	12.16	10.30	4.98
'AS 084'	Mean ± SD	1.25 ± 0.39	16.6 ± 2.40	11.6 ± 1.51	3.4 ± 0.65	11.4 ± 0.65
	Variation Limits	0.83 - 1.82	14.00 - 19.00	10.00 - 14.00	2.50 - 4.00	10.50 - 12.00
	CV%	30.85	14.51	13.07	19.17	5.72
'AS 086'	Mean ± SD	2.08 ± 0.98	21.40 ± 5.90	14.60 ± 2.41	3.90 ± 0.89	6.40 ± 0.42
	Variation Limits	1.15 - 3.15	16.00 - 30.00	12.00 - 18.00	3.00 - 5.00	6.00 - 7.00
	CV%	47.14	27.57	16.50	22.93	6.54
'AS 088'	Mean ± SD	1.95 ± 0.66	19.90 ± 5.15	14.10 ± 1.39	3.80 ± 0.57	9.30 ± 1.72
	Variation Limits	1.05 - 2.82	13.00 - 15.00	12.00 - 15.50	3.00 - 4.50	8.00 - 12.00
	CV%	33.79	25.89	9.84	15.00	18.47
'Traian'	Mean ± SD	1.89 ± 0.41	19.50 ± 1.66	13.96 ± 1.26	3.94 ± 0.53	10.10 ± 0.74
	Variation Limits	1.28 - 2.36	17.00 - 21.00	12.00 - 15.00	3.40 - 4.50	9.00 - 11.00
	CV%	21.86	8.50	9.01	13.50	7.34

CV %= coefficient of variability; SD = standard deviation.

Regarding the sugar content of the analyzed melon fruits, it recorded the highest value of 11.40% in the fruits of the cultivar 'AS 084', closely followed by the cultivars 'Dăbuleni 60' and 'Traian', with a value of 10.10% of sugar content. The values obtained for the sugar content following the study carried out are higher than those reported by Aragao et al., 2013, respectively a content between 3.3 and 8° Brix.

Analyzing the data from Table 3, it appears that in 2023 the 'AS 086' cultivar stood out with the highest average values obtained for the height, diameter, and weight of the fruits, and the 'Traian cultivar' stood out for the pulp thickness of the melon fruits.

As for the production of melons according to the cultivar (table 4), it varied between 22.33 t/ha for cultivar 'AS 088' and 29.07 t/ha for cultivar 'AS 038'. Of the other cultivars, only two recorded productions of over 25 t/ha, respectively the cultivars 'Dăbuleni 60' with a production of 25.91 t/ha and 'AS 040' with 28.66 t/ha.

The results obtained from our study are lower but in accordance with the specialized literature, where Toma et al., 2016, mentioned for the cultivars studied in 2012 a production that varied between 23.9 t/ha and 44.5 t/ha, and in 2013, a production between 27.0 t/ha and 40.1 t/ha.

Table 4. The production of melon cultivars studied under the conditions of sandy soils in the southern part of Oltenia

Cultivar	Average production (t/ha)	Relative production (%)	The difference (t/ha)	Significance
'Dăbuleni 60'	25.91	100.00	0.00	the witness
'AS 038'	29.07	112.18	3.16	ns
'AS 040'	28.66	110.62	2.75	ns
'AS 084'	24.47	94.45	-1.44	ns
'AS 086'	23.90	92.25	-2.01	ns
'AS 088'	22.33	86.18	-3.58	ns
'Traian'	24.68	95.26	-1.23	ns
DL 5% 6.78		DL 1% 9.30	DL 0.1% 12.66	

CONCLUSIONS

Following the research carried out, cultivar 'AS 086' stood out in terms of fruit height, diameter, and weight, and in terms of dry matter content, cultivars 'AS 084', 'Dăbuleni 60', and 'Traian' stood out with a value of over 10% sugar.

From the point of view of the realized productions, the cultivars 'AS 038' and 'AS 040' stood out with productions of over 25 t/ha.

Thus, following the analysis of the obtained results, we can conclude that most of the studied cultivars adapt well to the climatic conditions of sandy soils.

REFERENCES

Aragão, F. A. S., Torres Filho, J., Nunes, G. H. S., Queiróz, M. A., Bordallo, P. D. N., Buso, G. S. C., ... & Bezerra Neto, F. (2013). Genetic divergence among accessions of melon from traditional agriculture of the Brazilian Northeast. *Genetics and Molecular Research*, *12*(4), 6356-6371.

Cabello María Jesús, Castellanos María Teresa, Romojaro F., Martinez C., Ribas F. 2009. Yield and quality of melon grown under different irrigation and nitrogen rates. *Agricultural Water Management*. Elsevier. London. **96**: 866-874.

Can, H., & Türkmen, Ö. (2022). Collection of local Kyrgyzstan Melon genotypes and determination of morphologicalrelationships between some Anatolian Melons. *Turkish Journal of Agriculture and Forestry*, *46*(2), 257-270.

Castellanos María Teresa, Cabello María Jesús, Cartagena María Del Carmen, Tarquis Ana María, Arce A., Ribas F. 2011. Growth dynamics and yield of melon as influenced by nitrogen fertilizer. *Sciencia agricola (Piracicaba, Braz.) Soils and Plant Nutrition*. Taylor & Francis Press.London. **68**(2): 191-199.

Ciuciuc Elena. 2003. Research on the influence transplant's age upom the early and the production of watermelons and melons. *Scientific Works of Central Research Station for Agricultural Plants on Sands Dabuleni*. Universitaria Press. Craiova. **15**: 191-196.

Drăghici, R., Diaconu, A., Străjeru, S., Drăghici, I., Croitoru, M., Paraschiv , A. N., & Dima, M. (2018). Studies on the conservation of biodiversity of the traditional yellow melon genetic resources. Oltenia, Studii si Comunicari Seria Stiintele Naturii, 34(1).

***FAO (FOOD AND AGRICULTURE ORGANIZATION). 2007. FaoStat. Available at:

http://faostat.fao.org/site/567/DesktopDefault.aspx#ancor. [Links]. (accessed March 12, 2018).

Katsumi Higashi, Kazushige Hosoya, Hiroshi Ezura. 1999. Histological analysis of fruit development between two melon (*Cucumis melo reticulatus* L.) genotypes setting a different size of fruit. Journal of Experimental Botany. Elsevier. Oxford. 50(339): 1593-1597.

Panagiotopoulos L. 2001. Effects of nitrogen fertigation on growth, yield, quality and leaf nutrient composition of melon. Acta Horticulturae. International Society for Horticultural Science. Brussels. 563: 115-121.

Rubaiyat Sharmin Sultana & Mahabubur Rahman MD. 2014, Melon crops improvement through biotechnological techniques for the changing climatic conditions of the 21st century. International Journal of Genetics and Genomics. Elsevier. Paris. 2(3): 30-41.

Sari, N., & Solmaz, I. (2005, September). Fruit characterization of some Turkish melon genotypes.In *III International Symposium on Cucurbits 731* (pp. 103-109).

Soltani, F., Akashi, Y., Kashi, A., Zamani, Z., Mostofi, Y., & Kato, K. (2010). Characterization of Iranian melon landraces of *Cucumis melo* L. Groups Flexuosus and Dudaim by analysis of morphological characters and random amplified polymorphic DNA. Breeding Science, 60(1), 34-45.

Stepanasky, A., I. Kovalski and R. Perl-Treves (1999) Intraspecific classification of melons (*Cucumis melo*) in view of their phenotypic and molecular variation. Plant Sys. Evol. 217: 313–332.

Szamosi C, Solmaz I, Sari N, Bársony C (2010). Morphological evaluation and comparison of Hungarian and Turkish melon (*Cucumis melo* L.) germplasm. Sci Hortic-Amsterdam 124 (2): 170-182. doi: 10.1016/j.scienta.2009.12.024

Toma V., Diaconu Aurelia, Ciuciuc Elena, Croitoru Mihaela, Ploae Marieta, Rățoi I.,Nanu Ş., Lascu N., Hănescu V., Șandru Lucia. 2011. Ecological culture of melons with grafted plants on sandy soils. Sitech Publishing House. Craiova. 60 pp.

Vasile, T., Iulian, R., & Emanuela, V. C.(2016). Comportarea unor cultivare de pepeni galbeni pe solurile nisipoase the behaviour of some cultivars of melons on sandy soils in the south-west OLTENIA. *Sustainable exploitation of environmental resources in areas with sandy soils*, 139.