

STUDY OF SOME PEPPER GENOTYPES (*Capsicum annuum* L.) UNDER THE CONDITIONS OF THERMAL AND WATER STRESS IN THE SOUTHERN AREA OF OLTENIA

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ABSTRACT

In recent years increasingly many spoken of global climate change, desertification and aridity in many areas, such as the sandy soils in southern of the Oltenia area. Starting from the idea that the negative effect of temperature and water stress factors can be reduced by scientific and technological progress, it

*requires the collection and evaluation of genetic resources vegetable, adapted of conditions from southern Oltenia. In this regard, at CCDCPN Dăbuleni were followed in the crop 4 cultivation of domestic pepper (*Capsicum annuum* L.): Isalnita 85 V, Andrada, Isalnita – Rovine, Amaradia.*

INTRODUCTION

The southern Oltenia sands area is an area with a tradition in cultivating vegetable species, an area subject to desertification and aridization as a result of global climate change. The average air temperature has been increasing since 1985. The multiannual average temperature was 10.9 ° C in 1994, increasing to 11.3 ° C in 2013. Regarding the pluviometric regime, the tendency is insignificant decreasing.

Taking into account these considerations, it is necessary to cultivate

pepper genotypes adapted to the heat and water stress. It is necessary to evaluate the autochthonous germplasm fund in order to identify genotypes possessing these characteristics, which will be used in the improvement works in order to create cultivars adapted to the conditions of thermal and water stress.

This paper seeks to respond to these requirements, enhancing the behavior of autochthons pepper cultivars in the conditions of thermal stress and water stress from RDSPCS Dabuleni.

MATERIALS AND METHODS

For the achievement of the proposed objectives, it have been studied, under thermal and water stress

conditions, 4 sweet pepper cultivars created at SCDL Ișalnița (table 1).

Table 1

The cultivars of sweet peppers studied at RDSPCS Dabuleni

Crt. no.	The cultivar	Position of the fruit on the plant	The shape of the fruit	Fruit color at technical maturity	Fruit color at physiological maturity
1	Ișalnița 85 V	pendulum	conical	green-yellowish	red
2	Andrada	upright	conical	green-yellowish	red
3	Ișalnița-Rovine	pendulum	prismatic	yellow-greenish	red
4	Amaradia	upright	prismatic	dark green	red

The experience was bifactorial:
 - Factor A with two graduations of the irrigation regime: a_1 – irrigation with small watering norms, in critical moments and a_2 – irrigation according to the specific technology for sweet pepper culture on sands;

- Factor B: the four cultivars of sweet peppers, presented in Table 1.

The climatic conditions between May and September 2016 are shown in Table 2.

Table 2

Climatic conditions between May and September 2016, recorded at the RDSPCS Dabuleni weather station

Climatic element	Month				
	May	June	July	August	September
Medium temperature (°C) / first decade	13.7	20.2	24.3	26.1	22.7
Medium temperature (°C) / second decade	16.4	24.0	24.1	22.3	21.5
Medium temperature (°C) / third decade	20.3	26.6	25.8	22.1	17.0
Medium temperature (°C)	16.8	23.6	24.8	23.5	20.4
Maximum temperature (°C)	32.9	37.3	38.0	38.0	34.1
Minimum temperature (°C)	5.5	11.0	11.4	11.0	5.1
Precipitations (mm)	104.4	53.2	31.6	1.0	37.6
Multiannual medium temperature (°C)	16.7	21.6	23.1	22.4	17.8
Precipitations, multiannual total (mm)	61.40	69.56	53.51	37.88	48.00

The irrigation regime used is shown in Table 3.

Table 3

Date of watering applied to the sweet pepper experience (Dăbuleni 2016)

Irrigation regim	Month				
	May	June	July	August	September
a_1	23.05	24.06	08.07 20.07	03.08 15.08 29.08	12.09 23.09
	23.05 30.05	10.06 17.06 24.06	01.07 08.07 11.07 19.07 22.07 26.07 29.07	03.08 06.08 10.08 12.08 15.08 19.08 23.08 29.03	02.09 06.09 09.09 12.09 16.09 23.09 27.09

The irrigation of the sweet pepper plants was made by drip irrigation method with a watering norm of 200 m³ / ha.

RESEARCH RESULTS

Analyzing the climatic data in Table 2, it follows that the rainwater regime was raised in May, 104.4 mm, declining in June, July and August. August was a very droughty month, when the precipitations were only 1.0 mm, increasing in September to 37.6 mm. As a result, the number of waterings was higher in July, August and September: for a_1 level two waterings were applied in July and September and 3 waterings in August, with a norm of 200 m³ water / ha / 1 watering, and for a_2 level the number of waterings was much higher, 7 in July and September and 8 in August, the most droughty month.

The irrigation regime influenced the growth and development of sweet pepper cultivars subject of the study. The lack of water during the vegetation period influenced the level of total average productions. Following the data in Table 4, there is no big differences between varieties within the same irrigation level. In the case of the first irrigation variant, a_1 , all cultivars achieved a total low production of 18.03 t / ha at Isalnița - Rovine and 24.29 t / ha at Amaradia, the differences from the Isalnița 85V cultivar being small, without statistical assurance.

Table 4

Total production of the sweet pepper according to the irrigation variant and cultivar

Irrigation variant	The cultivar	Average production		The difference ± t / ha	The significance of the difference
		t / ha	%		
a_1	Ișalnița 85 V	21,60	100,0	-	-
	Andrada	20,86	96,6	-0,74	-
	Ișalnița-Rovine	18,03	83,5	-3,57	-
	Amaradia	24,29	112,5	+2,69	-
a_2	Ișalnița 85 V	43,78	100,0	-	-
	Andrada	55,09	125,8	+11,31	***
	Ișalnița-Rovine	43,85	100,2	+0,07	-
	Amaradia	41,79	95,5	-1,99	-

DL 5% = 4.29 t/ha DL 1% = 6.02 t/ha DL 0.1%= 8.51 t/ha

In the second irrigation variant, a_2 , the total production is high, 41.79 t / ha for the Amaradia cultivar and 55.09 t / ha for Andrada, with a production difference compared to the control variant of 11,31 t / ha, statistically ensured difference, being very significant, positive.

Depending on the cultivar and the irrigation variant (Table 5), comparing the cultivars of the two variants of irrigation, the production differences are

highlighted. It can be noticed that in the case of normal irrigation (a_2) the total recorded productions are almost double compared to the reduced irrigation variant (a_1), values ranging from +17.50 t / ha for the Amaradia cultivar and +34.23 t / ha for Andrada. The differences between cultivars, depending on the irrigation regime, are statistically ensured, the differences being positive, very significant.

Table 5

Total production of the sweet pepper according to the cultivar and the irrigation variant

The cultivar	Irrigation variant	Average production		The difference $\pm t / ha$	The significance of the difference
		t / ha	%		
Ișalnița 85 V	a ₁	21,60	100,0	-	-
	a ₂	43,78	202,7	+22,18	***
Andrada	a ₁	20,86	100,0	-	-
	a ₂	55,09	264,1	+34,23	***
Ișalnița-Rovine	a ₁	18,03	100,0	-	-
	a ₂	43,85	243,2	25,82	***
Amaradia	a ₁	24,29	100,0	-	-
	a ₂	41,79	172,0	17,50	***

DL 5% = 4.29 t/ha DL 1% = 6.02 t/ha DL 0.1% = 8.51 t/ha

Table 6

Total sweet pepper production according to the interaction of the irrigation regim and cultivar (axb)

Comparison	Total production (t/ha)	The difference $\pm t / ha$	The significance of the difference
a ₂ b ₁ -a ₁ b ₁	43.78 - 21.60	23.18	**
a ₂ b ₂ - a ₁ b ₁	55.09 - 21.60	33.49	***
a ₂ b ₃ - a ₁ b ₁	43.85 - 21.60	22.25	**
a ₂ b ₄ - a ₁ b ₁	41.79 - 21.60	20.19	**
a ₂ b ₁ -a ₁ b ₂	43.78 - 20.86	22.92	**
a ₂ b ₂ - a ₁ b ₂	55.09 - 20.86	34.23	***
a ₂ b ₃ - a ₁ b ₂	43.85 - 20.86	22.99	**
a ₂ b ₄ - a ₁ b ₂	41.79 - 20.86	20.93	**
a ₂ b ₁ -a ₁ b ₃	43.78 - 18.03	28.75	**
a ₂ b ₂ - a ₁ b ₃	55.09 - 18.03	37.06	***
a ₂ b ₃ - a ₁ b ₃	43.85 - 18.03	25.82	**
a ₂ b ₄ - a ₁ b ₃	41.79 - 18.03	23.76	**
a ₂ b ₁ -a ₁ b ₄	43.78 - 24.29	19.49	**
a ₂ b ₂ - a ₁ b ₄	55.09 - 24.29	30.80	**
a ₂ b ₃ - a ₁ b ₄	43.85 - 24.29	19.56	**
a ₂ b ₄ - a ₁ b ₄	41.79 - 24.29	17.5	**

DL 5%=5.77 t/ha DL 1%=7.53 t/ha DL 0.1%=33,14 t/ha

The data presented in Table 6 highlight the interaction of the two factors, irrigation regime (A) and cultivars (B). It can be noticed that all differences in total productions of each cultivar from the irrigation variant a₂ versus each cultivar in the irrigation variant a₁ are positive,

statistically assured. In all comparisons, the Andrada cultivar differs from other cultivars, recording values of +30.80 t / ha to +37.06 t / ha.

The irrigation regime influences the growth and development of pepper plants (Table 7).

Table 7

The influence of the irrigation regime on the growth and development of plants and fruits at the sweet pepper

The cultivar	Irrigation variant	Plant height (cm)	Length of fruit (cm)	Fruit diameter (cm)	Pericarp thickness (mm)	Average fruit weight (g)
Ișalnița 85 V	a ₁	42,4	8,2	4,8	4,6	61,4
	a ₂	60,9	9,1	5,4	5,4	82,0
Andrada	a ₁	45,1	8,1	4,5	4,2	48,2
	a ₂	68,3	8,9	5,0	4,8	65,8
Ișalnița-Rovine	a ₁	40,0	7,5	4,8	4,6	61,0
	a ₂	57,0	8,2	5,5	5,6	84,7
Amaradia	a ₁	50,7	7,3	5,9	4,2	72,6
	a ₂	71,3	8,3	6,9	4,8	116,4

It can be noticed that in the case of the reduced irrigation variant, a₁, the plants are less developed, the average height of the plants being lower than at the plants with the normal irrigation variant, differences of approximately 20 cm for each cultivar. The size and weight

of the fruits also underwent alterations; in the case of reduced irrigation the fruits were smaller and with a lower average weight. The thickness of the pepper fruit pericarp, a quality element, has higher average values at the variant with normal irrigation regime.

CONCLUSIONS

1. The irrigation regime influences the level of total production at the sweet pepper cultivars studied at RDSPCS Dabuleni, the production being double in the case of the variant with normal irrigation compared to the variant with reduced irrigation.

2. In the case of the reduced irrigation variant, all cultivars suffered, the recorded productions being small and of poor quality. The Amaradia cultivar recorded the highest yield of 24.29 t / ha, showing resistance to the water stress.

3. Cultivars Isnalita 85V, Andrada and Amaradia under reduced irrigation conditions have achieved a total production of over 20.0 t / ha, showing an adaptation to the conditions of water stress.

4. On a normal irrigation, all cultivars recorded high yields of over 40.0 t / ha, the Andrada cultivar recording 55.09 t / ha, with a difference from the control variant statistically insured.

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