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The period of founding culture and leading system in vegetation, determinant technological factors of tomato culture profitableness in industrial greenhouses with unconventional energetic consume

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Abstract Tomato crop production provides an easy and efficient market capitalization, with the lowest energy consumption compared to other vegetable crops such as thermophilic peppers, eggplants and cucumbers, the dominant species in greenhouse and solarium cultures. The existing situation in terms of opportunities for growers of allocating energy balance, which will not affect the profitableness of tomato culture, required choosing an assortment of tomato hybrids to correspond to the current needs, the supply of seed on the market of specialised firms being extremely rich.

New hybrids in recent years have arisen in terms of production levels achieved and their quality, but they must be studied under various aspects. The behaviour of different densities in culture is essential given that because of lower energy available due to a low price/Gcal always growing, planting is done late, one of which was the beginning of March.

Similarly important is the aspect of leading mode in growth period, hence deriving conclusions on the profitability of culture, profit is strongly influenced by the costs incurred, these varying according to culture density.[2] This paper presents the behaviour of two of the newest hybrids of tomato semidetermined growth, grown in industrial greenhouses with unconventional heating in terms of culture profitableness under the influence of the culture period founding and vegetation leading system.

Key words

cultivation, production, hybrid, energy consumption, sortiment, profitableness

Tomato culture, analyzed the development in the past 10-15 years, shows an areas' increase in cycle I and stagnation in their second cycle of production. There was a sharp drop in second cycle areas to less than one third of the cultivated area previously. This evolution is not random, because tomatoes were represented in the structure of the early cultures of work with equal surface to that of cucumbers.

The shift in the integration of tomato crop structure adjustment was the solution to energy crisis both physically (amount of Gcal/ha) and financial (price/Gcal). Tomatoes have made an easy and efficient production sold on the market, with the lowest energy consumption compared to other thermophilic crops such as peppers, eggplants and cucumbers, the predominant species of crops in greenhouses. Finally, it got to growing tomatoes in semiheated greenhouses with the planting early March or in unheated greenhouses with the planting period April 15 to May 10.[1]

In the ensuing period of 1995 the share of tomato crop in vegetable species grown in the range of cycle II has suffered a dramatic decline due mainly to reasons besides unheated greenhouse cultivation and crop damage this very serious disease produced tomato spotted wilt virus (T.S.W.V.). The place was gradually taken by cornichon cucumber culture that has spread to 80% or even 100% of the total area of greenhouses, also long cucumber crop substitution in cycle II, which have hardly had an outlet to exploit consumers because of their untarget to production possibilities for a recovery in consumption during winter storage [3].

In the new created situation it was necessary the choose of a sort of hybrids to correspond to the current needs, their selection criteria to reach for each grower, depending on the requirements of consumers in the visual appearance of goods, but also its organoleptic quality.

New hybrids that were noted in terms of level and quality of productions must be examined from different aspects. The behaviour of different densities in culture is essential given that more energy available due to reduced planting is carried out in different periods, one of them at the beginning of March.

Similarly important is the question of leadership in growth mode, hence deriving conclusions on the profitability of culture, profit is strongly influenced by the costs incurred by them in varying density culture.

Material and Method

Experiment on the influence of technological links (period of culture founding and plants leading system) on the yield and quality of two hybrids Bacchus F1 and Vulkanus F1 developed in Curtici greenhouses (S.C. AGRONIN S.R.L.) during the first cycle 2009 - 2010.

Plantings were made in the two periods of culture established (1 to 10 February 2009 - 2010, and 1 to 10 March 2009 - 2010) for both hybrids being set comparative cultures. Parcels settlement was made after the experimental technical norms, organizing them in Latin rectangle. Each plot contained 24 plants in three repetitions at a culture density of 28000 pl./ha in case of a single plant stem leading and 14000 pl./ha plant in case of two plant stems (Tp + Lp).

A plot area was 20 m^2, the distance between rows of plants being 80 cm and the distance between plants in the row corresponding to the cultivation density resulting from the calculation, being of 30-50 cm.

The aim of the research was to study the behaviour, in terms of quality and productive potential, of two new tomato hybrids with semidetermined growing, Vulkanus F1 and Bacchus F1, under the established culture calendar in two different periods (one month difference in time) and vegetation leading in two different systems namely:

- tomato plants' leading on two stems (main stem – Ms and prefloral shoot – Ps) - modified thrust management system - technological and economic reasons, which conducted research to be specified and demonstrated;

- tomato plants' leading on single stems – axial system unchanged

This way, it was established a trifactorial experience, where the experimental factors are:

Factor A – The hybrids

a_1 – Vulkanus F1

a_2 – Bacchus F1

Factor B – Culture period founding

b_1 – 1-10 February

b_2 – 1-10 March

Factor C – Density cultivation

c_1 – axial unchanged system (a single stem with 28000 pl./ha)

c_2 – modified system (two stems - the main stem + prefloral shoot with 14000 pl./ha)

The research objectives were those related for determining:

- the number of fruits per plant from a single stem or cumulated of the two stems (main stems and prefloral shoot) in each variation of density, which by dynamic harvesting and determination of their individual weight by weighting led to the production of each plant in the experimental plot;

- the average production per plant, which was the basis for calculating the average production per unit area (kg/m^2, kg/ha or t/ha) in each leading system and culture founding variant;

- the harvesting dynamics per months in physical and percentage units;

- the energy consumption in Gcal/ha and Gcal/t of production;

- the production profitableness depending on culture founding period and leading system in the growing period of plants.

Results and Discussions

Table 1 presents experimental data on the number of fruits per plant for Bacchus F1 and Vulkanus F1 hybrids correlated with their average weight and average production per plant and per hectare. The results show the strong influence of genotype on this component in relation with the leading system in the growing period of plants (factor C) of cultures founded in the two planting periods (factor B).

By setting, is found that under the influence of the two factors, B – culture founding period and C - leading system in the growing period of plants, Vulkanus F1 hybrid (a_1) overpasses Bacchus F1 (a_2) in all respects, except the number of fruits per plant. Thus, Vulkanus F1 (a_1), based on calculations made, regarding the two aspects of the production, the average production per plant for b_1 (1-10.02) was 5901 kg/pl. implicitly a yield of 115.3 t/ha compared with Bacchus F1 (a_2) in the same culture founding period, in which the production/plant is 5.657 kg and 110.7 t/ha.

Table 1

Results of the production obtained from Vulkanus F1 and Bacchus F1 hybrids planted in different culture founding periods and different leading systems in the growing period on one stem (28.000 pl/ha) and two stems (14000 pl/ha) in cycle I, 2009-2010

Factor A – The hybrid	Factor B – Culture founding period	Factor C- leading system in the growing period		No. fruits (pcs. /plant)	Average weight of a fruit (g/pcs)	Average yield (kg/ plant)	Average yield /ha (t/ha)	Factor B				Factor A			
								No. of fruits/ plant (T=Tp+L)	Average weight of a fruit (g/pcs)	Average yield (kg/pl)	Average yield (t/ha)	No. of fruits/ plant (T=Tp+L)	Average weight of a fruit (g/pcs)	Average yield (kg/pl)	Average yield (t/ha)
a_1- Vulkanus F1	b_1 – 1-10 February	c_1-Stem		35,1	133,2	4,675	130,9	44,4	132,9	5,901	115,3	45,3	131,7	5,956	116,6
		c_2	Stem	31,9	134,6	4,294	60,1								
			Shoot	21,8	129,9	2,832	39,6								
			Total	53,7	132,7	7,126	99,7								
	b_2 – 1-10 March	c_1-Stem		36,8	130,9	4,817	134,9	46,2	130,4	6,011	117,9				
		c_2	Stem	35,2	132,0	4,646	65,0								
			Shoot	20,3	126,0	2,558	35,8								
			Total	55,5	129,8	7,204	100,9								
a_2 - Bacchus F1	b_1 – 1-10 February	c_1-Stem		35,9	125,3	4,498	125,9	45,6	124,3	5,657	110,7	46,2	124,4	5,740	112,1
		c_2	Stem	32,1	123,9	3,97	55,7								
			Shoot	23,2	122,1	2,863	39,7								
			Total	55,3	123,2	6,815	95,4								
	b_2 – 1-10 March	c_1-Stem		36,8	124,1	4,567	127,9	46,8	124,5	5,823	113,5				
		c_2	Stem	35,1	125,4	4,402	61,6								
			Shoot	21,6	123,9	2,676	37,5								
			Total	56,7	124,8	7,078	99,1								

Table 2

Synthesis of the results concerning the interaction impact between the experimental factors upon the production and quality of Vulkanus F1 and Bacchus F1 hybrids in cycle I, 2009-2010

Factor A (The hybrid)	Factor B – Culture founding period	Factor C- leading system in the growing period		Average yield /ha (t/ha)	Of which Qual.E+I		Factor B					Factor A					Factor C			
					t/ha	%	Yield (t/ha)	% than b_1	of which Qual. E+I			Yield (t/ha)	% than a_1	of which Qual. E+I			Average yield $b_{1-2}c_{1-2}$ (t/ha)	% than $b_{1-2}c_{1-2}$	of which Qual. E+I	
									t/ha	%	% than b_1			t/ha	%	% față de a_1			t/ha	%
a_1- Vulkanus F1	b_1 – 1-10 February	c_1-Stem		130,9	104,6	79,9	115,3	100,0	90,6	78,6	100,0	116,6	100,0	94,3	80,9	100,0	c_1-132,9	100,0	109,1	82,1
		c_2	Stem	60,1	46,6	77,5														
			Shoot	39,6	29,9	75,5														
			Total	99,7	76,5	76,7														
	b_2 – 1-10 March	c_1-Stem		134,9	113,6	84,2	117,9	102,3	98,0	83,1	108,2						c_2-100,3	75,5	79,5	79,2
		c_2	Stem	65,0	53,4	82,1														
			Shoot	35,8	29,0	81,0														
			Total	100,8	82,4	81,7														
a_2 - Bacchus F1	b_1 – 1-10 February	c_1-Stem		125,9	95,3	75,7	110,7	100,0	82,2	74,3	100,0	112,1	96,1	86,7	77,3	95,6	c_1-126,9	100,0	98,2	77,4
		c_2	Stem	55,7	41,0	73,6														
			Shoot	39,7	28,0	70,5														
			Total	95,4	69,0	72,3														
	b_2 – 1-10 March	c_1-Stem		127,9	104,4	81,6	113,5	102,5	91,2	80,4	110,9						c_2-97,3	76,7	73,5	75,5
		c_2	Stem	61,6	49,2	79,8														
			Shoot	37,5	28,7	76,5														
			Total	99,1	77,9	78,6														
Average value (Mx)	b_1 – 1-10 February	c_1-Stem		128,4	100,0	77,8	113,0	100,0	86,4	76,5	100,0	*	*	*	*	*	$c_1$129,9	100,0	104,5	80,4
		c_2- Stem+shoot		97,6	72,8	74,6														
	b_2 – 1-10 March	c_1-Stem		131,4	109,0	83,0	115,7	102,4	94,6	81,8	109,5	*	*	*	*	*	c_2-98,9	76,1	76,1	77,0
		c_2- Stem+shoot		100,0	80,2	80,2														
	*	c_1-Stem		129,9	104,5	80,4	*	*	*	*	*	*	*	*	*	*	129,9	100,0	104,5	80,4
		c_2- Stem+shoot		98,8	76,1	77,4	*	*	*	*	*	*	*	*	*	*	98,8	76,1	76,1	77,0
Average value (Mx)				114,4	90,5	79,1	114,4	101,2	90,5	79,1	104,7	114,4	98,1	90,5	79,1	97,8	114,4	*	90,5	79,1

Table 3

Production echelon of Vulkanus F1 and Bacchus F1 hybrids of the cultures founded in different periods with leading systems during the growing period on one or two stems in cycle I, 2009-2010

Factor B		Specification			Factor C – Leading system during the growing period			
					a_1 – Vulkanus F1		a_2 – Bacchus F1	
					c_1 – 28.000 pl/ha	c_2 – 28.000 (14.000x2) pl/ha	c_1 – 28.000 pl/ha	c_2 – 28.000 (14.000x2) pl/ha
Culture founding period	b_1 - 1 -10 February 2010/2011	Obtained production (t/ha)			130,9	99,7	125,9	95,4
		of which quality Extra + I			79,9	76,7	75,7	72,3
		Statistic			**	*	00	0
		Energy consumption of which:	Gcal/ha		1550	1550	1550	1550
			Gcal/1 t		11,8	15,5	12,3	16,2
		Harvesting dynamics per months	May	t/ha	51,8	35,8	47,3	31,7
				%	39,6	35,9	37,6	33,2
			June	t/ha	70,9	57,1	70,1	56,1
				%	54,2	57,3	55,7	58,8
			July	t/ha	8,2	6,8	8,5	7,6
				%	6,2	6,8	6,7	8,0
	b_2- 1-10 March 2010/2011	Obtained production (t/ha)			134,9	100,8	127,9	99,1
		of which quality Extra + I			84,2	81,7	81,6	78,6
		Statistic			***	-	000	-
		Energy consumption of which:	Gcal/ha		750	750	750	750
			Gcal/11		5,6	7,4	5,9	7,6
		Harvesting dynamics per months	May	t/ha	37,4	24,5	33,0	22,1
				%	27,7	24,3	25,8	22,3
			June	t/ha	81,3	63,0	78,1	62,4
				%	60,3	62,5	61,1	63,0
			July	t/ha	16,2	13,3	16,8	14,6
				%	12,0	13,2	13,1	14,7

Under the influence of factor b_2 (1-10.03) in Vulkanus F1 (a1) the production does not differ too much, being of 117.9 t/ha while at Bacchus F1 (a_2) it is 113.5 t / ha, meaning 96.3% by comparison.

Table 2 summarizes the experimental results in terms of influences and unilateral interactions of the experimental factors. The table is actually a summary of the results including separately the two hybrids under the impact of the two factors B and C.

The comparative analysis in terms of unilateral influences of the three experimental factors determined at Vulkanus F1 (a_1) the highest yields obtained in c_1 - unchanged axial leading system/leading on a single stem in both culture founding periods (b_1 - 1-10 February and b_2 - 1-10 March). Yields are 130.9 and 134.9 t/ha, 114.4 to 117.9% compared to the average value $\bar{Mx}$, the statistical differences in production being very significant negative and significant negative. Lower yields were obtained in both culture founding periods (b_1 and b_2) in c_2 - modified axial leading system / leading on two stems (b_1) of 99.7 t/ha, respectively 100.8 t/ha (b_2).

For Bacchus F1 (a_2), the lowest production obtained in b_1 (1-10 February) under the influence of both c_1 and c_2, was 125.9 and 95.4 t/ha - 110.1 and 83 4% than the average value $\bar{Mx}$. Under the influence of the second culture founding period (b_2 - 1-10 March), Bacchus F1 (a_2) achieved the highest yields in both graduations c_1 and c_2, of 127.9 t/ha and 99.1 t/ha respectively, or 111.8 and 86.6% than the average value $\bar{Mx}$. The lowest production for Bacchus F1 (a_2) is in b_1c_2 of 95.4 t/ha and in $b_2c_2$99.1 t/ha, or under the influence of c_2 - modified axial leading system/ leading on two stems.

After exhaustive analysis, table 2 shows that:

- Vulkanus F1 hybrid stands out with a production of 116.6 t/ha compared with Bacchus F1 of 112.1 t/ha, meaning 96.1%;

- Production quality E + I Vulkanus F1 is 94.3 t/ha at a rate of 80.9% of total, than 86.7 t/ha for Bacchus F1 in proportion of only 77.3%, which compared with Vulkanus F1 is of 95.6%;

- Under the impact of factor B – culture founding period - differential productions are achieved tha do not differ much between them; so under the influence of b_2 – 1-10 March yield is 115.7 t / ha, 2.4 % more than under the influence of b_1 - 1-10 February, that is 113.0 t / ha - 100.0%;

- Production quality E + I in b_2 (1-10.03) is 9.5% higher than in b_1 (1-10.02), meaning 94.6 t/ha (81.8%) versus 86.4 t/ha (76.55%);

- The benefits of culture founding in any of the two periods will result in economical efficiency analysis from table 5;

- under the influence of factor C – leading system during the growing period, graduation c_1 - unchanged axial leading system/leading on a single stem leads to a production of 129.9 t/ha (100.0%) compared with c_2 - modified axial leading system/leading on two stems, where production is only 98.8 t / ha, or 76.1%, lower with 23.9%;

- c_1 impact on the average value`s influence upon the production is kept even in the situation of analysis for each hybrid in part: a_1c_1 - 132.9 t / ha and a_1c_2 - 100.3 t/ha and a_2c_1 - 126.9 t/ha and a_2c_2 – 97.3 t/ha;

- under the impact of factor b_1 (1-10 February) productions obtained in combinations a_1b_1 and a_2b_1 were of 115.3 t/ha, respectively 110.7 t/ha and below that of b_2 (1-10 March) 117.9 t/ha - 102.3% in a_1b_2 and 113.5 t/ha - 102.5% in a_2b_2.

Quality productions E + I are in the range of 75.5-84.2% in a_1 (Vulkanus F1) and 70.5-81.6% in a_2 (Bacchus F1). For a_1-Vulkanus F1 the average obtained production is 116.6 t/ha, of which 94.3 t/ha - 80.9% production quality E+I and for a_2 - Bacchus F1 of 112.1 t/ha, of which 86.7 t/ha - 77.3% production quality E+I.

Table 3 and graph in figure 1 show, besides the differential energy consumption for the two culture founding periods, the harvesting dynamics per months in physical and percentage units, differentiated for the same periods.

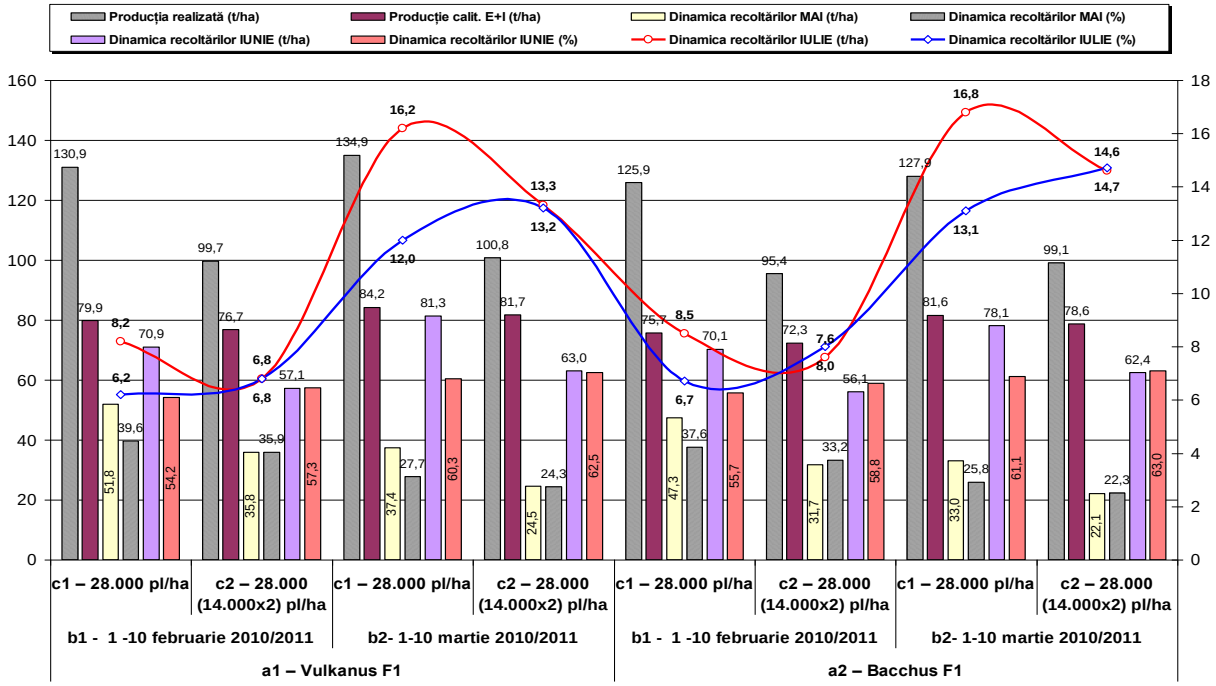

Fig. 1. Production echelon of Vulkanus F1 and Bacchus F1 hybrids of the cultures founded in different periods with leading systems during the growing period on one or two stems in cycle I, 2009-2010

In the same table and figure there are presented in addition to production levels achieved under the influence of interactions between the three factors of production also the echelon of production obtained in May-July period.

It follows from the analysis of this table a deeper earliness of production under the influence of c_1 - unchanged axial leading system/single stem leading system for both hybrids.

In Table 4 calculations based on mathematical statistics, specific for the methods of variance analysis, there are concretized the significances of productions' differences in comparisons made as a result of interdependence of the experimental factors.

Table 4

Unilateral impact and interactions between the experimental factors upon semidetermined growing tomato hybrids production under the impact of some technological links

Variant	Average production (t/ha.)		Relative production (%)	Difference (±t/ha)	Significance
1. Unilateral impact of the hybrid upon the production					
a2-a1	112,08	116,58	96,14	-4,50	000
a3-a1	114,34	116,58	98,08	-2,23	0
a3-a2	114,34	112,08	102,02	2,27	*
DL 5% = 1,83		DL 1% = 2,77		DL 0,1%= 4,45	
2. Unilateral impact of the culture founding period upon the production					
b2-b1	115,68	112,98	102,38	2,69	***
DL 5% = 0,93		DL 1% = 1,28		DL 0,1% = 1,77	
3. Unilateral impact of the plant leading system during growing period upon the production					
c2-c1	98,76	129,91	76,02	-31,15	000
DL 5% = 1,28		DL 1% = 1,73		DL 0,1% = 2,31	
4. Impact of the interactions between different hybrids and the same or different hybrids and the same or different culture founding periods upon the production					
a2b1-a1b1	110,65	115,30	95,97	-4,65	000
a3b1-a1b1	113,00	115,30	98,01	-2,30	0
a3b1-a2b1	113,00	110,65	102,12	2,35	*
a2b2-a1b2	113,50	117,85	96,31	-4,35	00
a3b2-a1b2	115,68	117,85	98,16	-2,17	0
a3b2-a2b2	115,68	113,50	101,92	2,18	*
a2b2-a1b1	113,50	115,30	98,44	-1,80	-
DL 5% = 2,15		DL 1% = 3,16		DL 0,1% = 4,87	
5. Impact of the interactions between the same hybrid and different culture founding periods upon the production					
a1b2- a1b1	117,85	115,30	102,21	2,55	**
a2b2- a2b1	113,50	110,65	102,58	2,85	**
a3b2- a3b1	115,68	113,00	102,37	2,68	**
DL 5% = 1,61		DL 1% = 2,22		DL 0,1% = 3,06	
6. Impact of the interactions between the same hybrid and different plant leading systems upon the production					
a1c2- a1c1	100,25	132,90	75,43	-32,65	000
a2c2- a2c1	97,25	126,90	76,64	-29,65	000
a3c2- a3c1	98,77	129,92	76,02	-31,15	000
DL 5% = 2,21		DL 1% = 3,00		DL 0,1% = 4,01	
7. Impact of the interactions between the same culture founding period and different plant leading periods upon the production					
b1c2- b1c1	97,56	128,41	75,97	-30,86	000
b2c2- b2c1	99,96	131,40	76,07	-31,44	000
DL 5% = 1,81		DL 1% = 2,45		DL 0,1% = 3,27	
10. Impact of the interactions between the same hybrid and the same culture founding period and different plant leading systems upon the production					
a1b1c2- a1b1c1	99,70	130,90	76,17	-31,20	000
a2b2c2- a2b2c1	99,10	127,90	77,48	-28,80	000
DL 5% = 3,13		DL 1% = 4,24		DL 0,1% = 5,67	
11. Impact of the interactions between the same hybrid and the same plant leading system and different culture founding periods upon the production					
a1b2c1- a1b1c1	134,90	130,90	103,06	4,00	**
a2b2c2- a2b1c2	99,10	95,40	103,88	3,70	*
DL 5% = 2,74		DL 1% = 3,73		DL 0,1% = 5,04	

The unilateral analysis of factor A (point 1 - hybrid influence on production) shows that the significance of differences in production are very significant negative, significantly negative and

significant positive, which shows the undeniable superiority of the hybrid Vulkanus F1 (a_1) from Bacchus F1 hybrid (a_2) and Bacchus F1 (a_2) from the average value of the experiment $M\bar{x}$ (a_3), which emerged from the analysis of other tables in the paper.

At point 2 where it is presented the influence of culture founding period of the two hybrids, it appears that there is a significance of the of the production difference very significant positive, showing that crop yields achieved by different culture founding periods are distinguished quantitatively whereas better light conditions (b_2 - 1-10 March) plants recover production so that the difference due to culture founding period in time fades and get even high productions. Productions' quality is even better than that obtained in an early culture founding period (tables 2 and 3).

The unilateral analysis of factor C (c_1, c_2) – plant leading system during the growing period, from point 3 shows that yields have achieved very significant negative differences, which show the superiority of unmodified axial leading system (leading on a single strain), the difference in production being 31.2 t/ha.

From the complex analysis of interactions between experimental factors, the significance of differences in production ranged from very significant positive and negative to significant positive and negative or no significance, depending on the combinations of experimental factors.

Table 5 and figure 2 show the economical efficiency of tomato culture in the polifactorial experiment.

Table 5

Economical efficiency of tomato culture in unconventional heated greenhouses in cycle I, spring-summer, 2009-2010

Specification	Factor A – the hybrid							
	a_1- Vulkanus F1				a_2- Bacchus F1			
	Factor B – culture founding period							
	b_1-1-10. II		b_2-1-10. III		b_1-1-10. II		b_2-1-10. III	
	c_1 - stem	c_2 –stem + shoot	c_1 - stem	c_2 –stem + shoot	c_1 - stem	c_2 –stem + shoot	c_1 - stem	c_2 –stem + shoot
Average yield of which (t/ha)	130,9	99,7	134,9	100,8	125,9	95,4	127,9	99,1
- quality extra + I (t/ha)	104,6	76,5	113,6	82,4	95,3	69,0	104,4	77,9
- quality II (t/ha)	26,3	23,2	21,3	18,4	30,6	26,4	23,5	21,2
Income (lei/ha)	484.150	364.000	339.025	249.600	457.700	342.000	316.475	240.725
Costs (lei/ha)	350.025	291.263	233.775	175.013	343.428	282.423	223.445	170.214
Profit (lei/ha)	134.125	72.737	105.250	74.587	114.272	59.577	93.030	70.511
Profitableness rate (%)	38,3	25,0	45,0	42,6	33,3	21,1	41,6	41,4

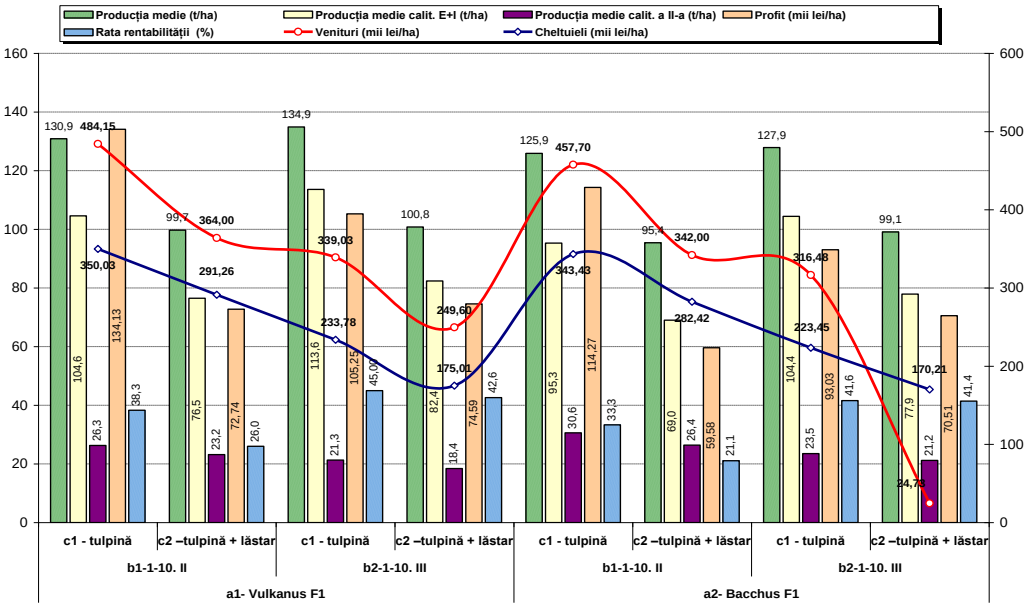

Fig. 2 Economical efficiency of tomato culture in unconventional heated greenhouses in cycle I, spring-summer, 2009-2010

It follows from this table for each hybrid an increased variability of income as a result of the influence of factor B (culture founding period) and factor C (plant leading system), the range of variability having extreme limits of 484150 lei (maximum) and 270725 lei (minimum), the difference being of 213425 lei.

The largest profit and highest profitableness rate were achieved regardless of the culture founding period under the influence of c_1 - unchanged axial leading system/leading on one stem, saving the expense of 50% by using of all seedlings in c_2 - modified plant leading system /leading on two stems, being much smaller than the extra revenue from the sale in addition to much higher production obtained in c_1 - unchanged axial leading system /leading on a single stem.

The highest profit was achieved in factorial combinations $a_1b_1c_1$ (134125 lei), $a_1b_2c_1$ (105250 lei) and $a_2b_1c_1$ (114272 lei) and $a_2b_2c_2$ (93030 lei). The highest profitableness rate is obtained under the influence of b_2 (1-10 March) in both hybrids and both plant leading systems during the growing period.

Conclusions and Recommendations

Yields obtained from Bacchus F1 and Vulkanus F1 hybrids in the experiment in cycle I of spring-summer 2009/2010 cultivated in different plant leading systems during the growing period in two planting periods in 1-10 February and 1-10 March, in greenhouses from S.C. AGRONIN S.R.L. Curtici lead us to the following conclusions:

1. *Vulkanus F1 hybrid* is highlighted in terms of average production level per hectare achieved by planting in both periods (first period 1-10February, and in the second 1-10March). Average yields achieved under the influence of factor C varie greatly between them, the highest being obtained under the influence of graduation c_1 - unchanged axial plant leading system (leading on a single stem) of 132.9 t/ha, 24.5% more than in c_2 - modified axial leading system (leading on two stems), where it amounts to 100.3 t/ha (75.5%).

2. *Bacchus F1 hybrid* in terms of yields achieved per hectare ressembles to Vulkanus F1 as differentiation under the influence of factor C, resulting in c_1 - unchanged axial plant leading system (leading on a single stem) a production of 126.9 t/ha, 23.3% more than in c_2 modified axial leading system (leading on two stems), where it obtained 97.3 t/ha (76.7%).

In the period of 1-10 February the average yield achieved was of 110.7 t/ha and 113.5 t/ha in 1-10 March, with an addition of 2.8 t/ha, Bacchus F1 hybrid retrieving and making further production, negating the effect of the delay of culture founding about a month later.

3. Vulkanus F1 hybrid *early productions*, are without exception the highest in the variant of planting period 1-10 February (b_1), being of 51.8 t/ha (39.6%) and 37.4 t/ha (27.7%) in 1-10 March (b_2) under the influence factor c_1 - unchanged axial plant leading system (leading on a single stem).

4. Bacchus F1 hybrid *early productions* are recorded in both periods of planting, the highest level under the influence of c_1 - unchanged axial plant leading system (leading on a single stem), meaning 47.3 t/ha -37.6% in b_1 and 33.0 t / ha - 25.8% in b_2.

5. *Production quality E + I* had the highest value for both hybrids in the second period of culture founding (1-10 March) when lighting conditions in the greenhouse are more favourable.

6. *The overall conclusion* is that for both hybrids in terms of productions achieved and the achievement of the highest profit and profitableness rate, the best culture founding period is 1-10 February and the plant leading system - unchanged axial plant leading system (leading on a single stem).

Yields, profits and profitableness rate achieved in the second stage of culture founding period (1-10.03) are higher under the influence of unchanged axial plant leading system (c_1 -leading on a single stem) for both hybrids, than in the first period (1-10.02) under the influence of c_2- modified system (two stems - the main stem + prefloral shoot.

Therefore, plant leading system on a single stem (c_1) in both periods for culture founding gives the best results, both physical and financial.

We recommend further researches for the definitive establishment of the general conclusion set out above.

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