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MANIFEST OF THE PRODUCTIVE POTENTIAL OF SOME TOMATO HYBRIDS WITH DETERMINED GROWTH CULTIVATED IN COLD SOLARIUMS UNDER THE IMPACT OF FLOWER STIMULATION AND FECUNDATION METHODS AND OF DIFFERENT MODERN FERTILIZERS

A. HORGOS [1], Alexandra BECHERESCU[1], D. POPA[1], Anişoara IENCIU[1], Anca DRĂGUNESCU[1], L. RUSU[2]

[1]Banat's University of Agricultural Sciences and Veterinary Medicine, Faculty of Horticulture and Forestry, Fruit Culture, Calea Aradului 119, 300645, Timisoara, Romania, Phone: 0256 277006, fax: 0256 277263
[2]Family association

Corresponding author email: horgos_a@yahoo.com

Abstract

In the past years, as a result of fuel price increase, there was registered a regression of surfaces cultivated with vegetables in greenhouses or solariums. Private growers started to cultivate vegetables in cold solariums, reducing by this the costs of obtaining productions, meaning heating costs. But there were necessary some other operations in order to maintain the productions that they would have obtained in conditions of heat and to compensate the decrease of early productions and the income costs. In this article we present the impact of some modern technology operations, which can determine high yields of two tomato hybrids with determined growth Magnus F1 and Maximus F1, known as being very good cultivated in cold solariums. Stimulation was done with Tomato-Stim, by natural pollination with bumble-bees (Natupol) and with Bionex (foliar fertilizer with plant extracts) all compared to a control variant where it occurred natural pollination. At the same time, there were applied two types of fertilizers – Agriplant and Kemira. Tomato-Stim gave good quantitative yields, while Natupol gave good qualitative yields. The productions obtained after applying Kemira fertilizer were with 15.5% till 15.9% higher than those obtained after applying Agriplant fertilizer. Both hybrids, Magnus F1 and Maximus F1 are valuable considering the quantity, but also the Extra and Ist quality productions, but Maximus F1 gave higher productions than Magnus F1 tomato hybrid.

Keywords: *growers, solariums, production, tomato, hybrids.*

INTRODUCTION

Price increase of fuel and of any kind of energy in general, led to the impossibility of growing vegetables in heated protected spaces by the vast majority of private farmers. There have been and continue to be affected small producers, especially those who ventured to cultivate vegetables as starters in the profession and not always have enough financial capital to ensure their start.

For this reason many farmers have shifted to growing vegetables in unheated rooms, solariums is most handy. But to increase the profitability of vegetable crop in case of tomatoes removing the heating costs is not enough, but also improving those technology links that offset the influence of lack of heating, which led to a big decrease in early production, but also of its quality of the first part of the harvest period.

"Modernization" of a technology culture, be it vegetable cultivation under shelter, meaning that some basic technological links (stimulation fertilization of flowers, modern types of fertilizers and hybrid performance), require improved of their depth, so that the effect produced to determine the profitability of the production as the defining elements, namely the productivity, quality and economic efficiency.

Hybrid, by its characteristics, nearby with the vegetation management system by changing or not axial system architecture of the plant and improving irrigation system and fertilization applied, can help achieve the goal of this profitable crop of tomatoes in the new conditions.

The contribution of the factors listed above that are competing to elucidating the problem taken in the survey in interpreting the complex relationships created between them, was studied in terms of their impact on improving production quantity and quality – superior, extra and Ist quality.

MATERIAL AND METHOD

This study upon tomato culture's profitability developed in Agrişu Mare locality, Târnova district, Arad County, an area where vegetables started to be cultivated on larger and larger surfaces, especially tomatoes and peppers, but also cabbage and cauliflower, by beginner private growers, who have a certain professional experience. The family association has almost 0.25 ha of cold solariums. The experiment had two tomato hybrids, relatively new in culture, which are Magnus F_1 from Sluis & Groot Novartis Company, Netherlands, and Maximus F_1 from De Ruiter Seeds (Siminis Company, Netherlands), both hybrids being sort of known by growers because of their qualities. Both hybrids were studied in terms of their productive potential and quality manifestation under the influence of application of two fertigation systems (modern chemical fertilizers Agriplant and Kemira) and the use of various methods to stimulate the fertilization of flowers.

The culture was established in the period 20-25th March 2011 in cold solariums, using 65 days seedlings at a 3.2 plants/m^2 density. In this purpose, there was organized a polifactorial experiment, in which the experimental factors were:

Factor A – Method of stimulating flower fecundation

a_1 – Mt – control, natural pollination (use of mechanical methods)

a_2 – Biostimulation with synthetic stimulants – Tomato-Stim

a_3 – Natural pollination with bumble-bees (Natupol)

a_4 – Biostimulation with Bionex (foliar fertilizer with plants extract)

Factor B – Fertilization system

b_1 – Modern fertilization with chemical fertilizer Agriplant (basic fertilization with rich soil and Agriplant 1-4 in vegetation period)

b_2 – Modern fertilization with chemical fertilizer Kemira (basic fertilization with Cropcare and Ferticare in vegetation period)

Factor C – the hybrid

c_1 - Magnus F_1

c_2 - Maximus F_1

The culture technology consisted in:

- drip irrigation through Netafim irrigation system (Israel);
- fertilization through drip irrigation system (fertirrigation) using Agriplant and Kemira (complex modern fertilizers for basic, starter and phasial fertilizations, with microelements for fertilizing irrigation and foliar fertirrigation).

This study had as goal to determine the profitability possibilities for tomatoes culture in cold solariums in the new competitive market, using as biological material the newest hybrids with determined growth that started to be cultivated in forced and protected spaces. At the same time there was observed their behavior as productive potential and production's quality, using extra-root fertilizers for completing root nutrition assured by completely soluble modern fertilizers Agriplant and Kemira.

RESULTS AND DISCUSSION

Tables 1 and 2 and figure 1 show the quantitative and qualitative obtained productions, and the share of extra and Ist quality productions under the impact of factor A (method of stimulating flower fecundation) and factor B (b_1 and b_2), fertilization with Agriplant and Kemira. The average number of fruits/plant is higher for both hybrids in case of b_2, being with almost 1.2-2.3 fruits higher than in b_1. At the same time, the average weight/fruit is higher in case of Kemira fertilization (b_2) with 11.7-13.6g/piece.

Table 1. Experimental results concerning tomato hybrids with determined growth culture in cold solariums, cycle I – 2011

Factor A (method of stimulating flower fecundation)	Factor B (fertirrigation system)	Factor C (the hybrid)	Average no.of fruits/plant	Average weight/fruit (g/piece)	Average production Kg/plant	t/ha	% than c_1	of which extra and Ist quality production t/ha	%
a_1- Control with natural pollination (mechanical methods)	b_1-Agriplant	c_1 - Magnus F_1	19,2	125,1	2,403	76,9	100,0	61,6	80,1
		c_2 - Maximus F_1	20,3	123,9	2,516	80,5	104,7	66,2	82,2
		Average c for a_1xb_1	*19,8*	*124,2*	*2,459*	*78,7*	*102,3*	*63,9*	*81,2*
	b_2-Kemira	c_1 - Magnus F_1	20,1	139,5	2,803	89,7	100,0	75,2	83,8
		c_2 - Maximus F_1	21,8	136,6	2,978	95,3	106,2	83,2	87,3
		Average c for a_1xb_2	*21,0*	*137,7*	*2,891*	*92,5*	*103,1*	*79,2*	*85,6*
	Average of factor B for factor a_1		***20,4***	***131,1***	***2,675***	***85,6***	*	***71,6***	***83,6***
a_2- Tomato-Stim	b_1-Agriplant	c_1 - Magnus F_1	31,6	120,3	3,803	121,7	100,0	85,8	70,5
		c_2 - Maximus F_1	33,4	118,9	3,972	127,1	104,4	95,0	74,7
		Average c for a_2xb_1	*34,5*	*119,6*	*3,888*	*124,4*	*102,2*	*90,4*	*72,7*
	b_2-Kemira	c_1 - Magnus F_1	31,9	134,9	4,303	137,7	100,0	97,9	71,1
		c_2 - Maximus F_1	34,0	131,9	4,484	143,5	104,2	108,5	75,6
		Average c for a_2xb_2	*33,0*	*133,2*	*4,394*	*140,6*	*102,1*	*103,2*	*73,4*
	Average of factor B for factor a_2		***32,7***	***126,6***	***4,141***	***132,5***	*	***96,8***	***73,1***
a_3- Natural pollination with bumble-bees (Natupol)	b_1-Agriplant	c_1 - Magnus F_1	27,4	128,3	3,516	112,5	100,0	91,9	81,7
		c_2 - Maximus F_1	28,2	130,0	3,666	117,3	104,3	97,7	83,3
		Average c for a_3xb_1	*27,8*	*129,2*	*3,591*	*114,9*	*102,1*	*94,8*	*82,5*
	b_2-Kemira	c_1 - Magnus F_1	29,5	140,4	4,141	132,5	100,0	114,2	86,2
		c_2 - Maximus F_1	30,7	141,4	4,341	138,9	104,8	122,8	88,4
		Average c for a_3xb_2	*30,1*	*140,9*	*4,241*	*135,7*	*102,4*	*118,5*	*87,3*
	Average of factor B for factor a_3		***29,0***	***135,0***	***3,916***	***125,3***	*	***106,7***	***85,2***
a_4- Bionex	b_1-Agriplant	c_1 - Magnus F_1	25,9	124,2	3,222	103,1	100,0	74,1	71,9
		c_2 - Maximus F_1	26,3	125,8	3,309	105,9	102,7	78,7	74,3
		Average c for a_4xb_1	*26,1*	*125,1*	*3,266*	*104,5*	*101,4*	*76,4*	*73,1*
	b_2-Kemira	c_1 - Magnus F_1	27,3	137,3	3,753	120,1	100,0	86,5	72,0
		c_2 - Maximus F_1	27,2	139,8	3,803	121,7	101,3	94,1	77,3
		Average c for a_4xb_2	*27,3*	*138,4*	*3,778*	*120,9*	*100,7*	*90,3*	*74,7*
	Average of factor B for factor a_4		***26,7***	***131,9***	***3,522***	***112,7***	*	***83,4***	***74,0***

Culture density: 32.000 plants/ha

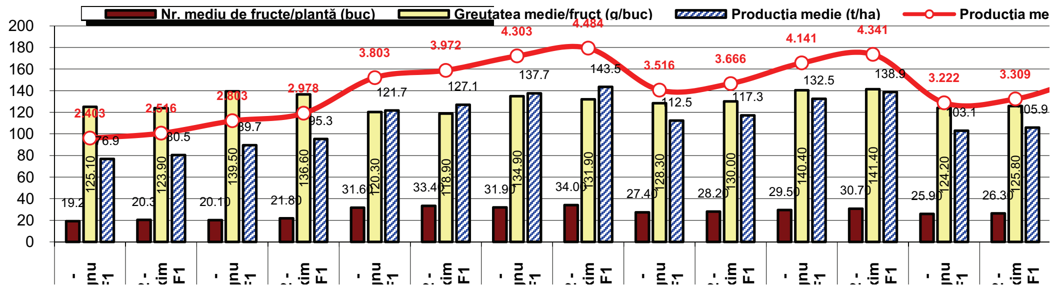

Fig.1. Experimental results concerning tomato hybrids with determined growth culture in cold solariums, cycle I – 2011

The average production/ha obtained under the impact of b_2 (Kemira) of 122.4 t/ha is vastly superior to the influence of b_1 – 105.6 t/ha, with 15.9 % higher. This if the calculation was made for the average experience Mx_1, where it was also the control - natural pollination (a_1). For Mx_2, eliminating from the calculation values Mt – natural pollination (a_1), the values for b_1 (Agriplant) and b_2 (Kemira) increase to 114.6 t/ha (100%) for b_1 and 132.4t/ha (115.5%) for b_2.

Considering extra and Ist quality productions under the impact of b_2 it was of 79.9 %, with 2.8 % more than in b_1, of 77.1 %.

As a conclusion, we can say that Kemira fertilizer had a great impact, its benefits being observed both upon obtained quantitative and qualitative productions, and also the weight and the number of fruits/plant.

Considering table 2 and figure 1 we can see that by interacting factor A with factor we obtain the same effects upon the production and its quality by fertilization with Kemira for both hybrids, of these two Maximus F1 being superior as obtained production – 125.7 t/ha and quality – 79.2% Extra + Ist quality production (101.8 t/ha).

Table 2. Synthesis of experimental results concerning tomato hybrids with determined growth culture in cold solariums in conditions of using some modernized technological links

Experimental factor			Average production for:																		
			Factor C				Factor B							Factor A							
					Of which E+I prod.					Of which E+I prod.							Of which E+I prod.				
A	B	C	t/ha	% than a_{1-5}	t/ha	%	t/ha	% than $a_{1-5}b_1$	% $a_{1-5}b_{1-2}$ than Mx_1b_{1-2}	t/ha	%	% than b_1	% than a_1b_{1-2}	t/ha	% than a_1	%a_{1-5} than Mx_1	t/ha	%	% than a_1	% than Mx_1	% than Mx_2
a_1	b_1	c_1	76,9	89,8	61,6	80,1	78,7	100,0	74,5	63,9	81,2	100,0	100,0	85,6	100,0	75,1	71,6	83,6	100,0	79,9	74,9
		c_2	80,5	94,0	66,2	82,2															
		a_1xb_1	78,7	91,9	63,9	81,2															
	b_2	c_1	89,7	104,8	75,2	83,8	92,5	117,5	75,6	79,2	85,6	123,9	100,0								
		c_2	95,3	111,3	83,2	87,3															
		a_1xb_2	92,5	108,1	79,2	85,6															
Average B for a_1			***85,6***	***100,0***	***71,6***	***83,6***	***85,6***	***108,8***	***75,1***	***71,6***	***83,6***	***112,0***	***100,0***								
a_2	b_1	c_1	121,7	91,8	85,8	70,5	124,4	100,0	117,8	90,4	72,7	100,0	141,5	132,5	154,8	116,2	96,8	73,1	135,2	108,0	101,3
		c_2	127,1	95,9	95,0	74,7															
		a_2xb_1	124,4	93,9	90,4	72,7															
	b_2	c_1	137,7	103,9	97,9	71,1	140,6	113,0	114,9	103,2	73,4	114,2	130,3								
		c_2	143,5	108,3	108,5	75,6															
		a_2xb_2	140,6	106,1	103,2	73,4															
Average B for a_2			***132,5***	***100,0***	***96,8***	***73,1***	***132,5***	***106,5***	***116,2***	***96,8***	***73,1***	***107,1***	***135,9***								
a_3	b_1	c_1	112,5	89,8	91,9	81,7	114,9	100,0	108,8	94,8	82,5	100,0	148,4	125,3	146,4	109,9	106,7	85,2	149,0	119,1	111,6
		c_2	117,3	93,6	97,7	83,3															
		a_3xb_1	114,9	91,7	94,8	82,5															
	b_2	c_1	132,5	105,7	114,2	86,2	135,7	118,1	110,9	118,5	87,3	125,0	149,6								
		c_2	138,9	110,9	122,8	88,4															
		. a_3xb_2	135,7	108,3	118,5	87,3															
Average B for a_3			***125,3***	***100,0***	***106,7***	***85,2***	***125,3***	***109,1***	***109,9***	***106,7***	***85,2***	***112,5***	***149,0***								
a_4	b_1	c_1	103,1	91,5	74,1	71,9	104,5	100,0	99,0	76,4	73,1	100,0	119,6	112,7	131,7	98,9	83,4	74,0	116,5	93,1	87,2
		c_2	105,9	94,0	78,7	74,3															
		a_4xb_1	104,5	92,7	76,4	73,1															
	b_2	c_1	120,1	106,6	86,5	72,0	120,9	115,7	98,8	90,3	74,7	118,2	114,0								
		c_2	121,7	108,0	94,1	77,3															
		a_4xb_2	120,9	107,3	90,3	74,7															
Average B for a_4			***112,7***	***100,0***	***83,4***	***74,0***	***112,7***	***107,8***	***98,9***	***83,4***	***74,9***	***109,1***	***116,5***								
a_5 (Mx1)	***b_1***	c_1	103,6	98,0	78,4	75,6	105,6	100,0	92,6	81,4	77,1	100,0	127,4	114,0	133,2	100,0	89,6	78,6	125,1	100,0	93,7
		c_2	107,7	101,9	84,4	78,4															
	b_1		105,6	100,0	81,4	77,1															
	b_2	c_1	120,0	97,9	93,5	77,9	122,4	115,9	107,4	97,8	79,9	120,1	123,5								
		c_2	124,9	102,0	102,2	81,8															
	b_2		122,4	100,0	97,8	79,9															
		c_1	111,8	98,0	86,0	76,9	*	*	*	*	*	*	*								
		c_2	116,3	101,9	93,3	80,2	*	*	*	*	*	*	*								
Mx_1			***114,1***	***100,0***	***89,6***	***78,6***	114,0	108,0	100,0	86,6	78,6	110,1	*								
a_6 (Mx2	***b_1***	*	*	*	*	*	114,6	100,0	92,8	87,2	76,1	100,0	136,5	123,5	144,3	108,3	95,6	77,4	133,5	133,5	100,0
	b_2	*	*	*	*	*	132,4	115,5	107,2	104,0	78,5	119,3	131,3								
	*	c_1	121,3	98,2	91,7	75,6	*	*	*	*	*	*	*								
		c_2	125,7	101,8	99,5	79,2	*	*	*	*	*	*	*								
Mx_2			***123,5***	***100,0***	***95,6***	***77,4***	123,5	107,8	100,0	95,6	77,4	109,6	*								

Out of this table we conclude that:

- in case of all graduations from factor A (method of stimulating flower fecundation) the obtained production under the impact of b_2 – Kemira is with 13.0% (a_2 – Tomato-Stim) up to 18.1% (a_3 – bumble-bees natural pollination - Natupol) higher tha under the impact of factor b_1 –Agriplant, which determined a maximum production of 140.6 t/ha (a_2 – Tomato - Stim);
- comparing the productions with Mx_1 (114.1 t/ha -100.0%), for b_1 (Agriplant) is of 105.6 t/ha – 92.6 %, while the production in b_2 (Kemira)

is of 122.4 t/ha – 107.4% and compared with b_1 (Agriplant) is of 115.9%;
- comparing the productions with Mx_2 the situation is normally different, the production in b_2 (Kemira) being of 132.4 t/ha (115.5%) higher than in b_1 (Agriplant) – 114.6 t/ha (100.0%). Comparing the productions in b_1 (Agriplant) and b_2 (Kemira) with Mx_2 – 123.5t/ha (100.0%) they are of 92.8% in b_1 and 107.2 % in b_2;
- under the impact of factor A (method of stimulating flower fecundation) productions obtained widely differ of both Mx_1-114.0 t/ha and Mx_2-123.5 t/ha;
- the highest production was obtained under the impact of a_2-Tomato – Stim, of 132.5 t/ha (154.8% than a_1- natural pollination, 116.2% compared with Mx_1 and 107.3% compared with Mx_2);
- productions quality under the impact of a_2 (Tomato-Stim) is the lowest 73.1% E+Ist quality production (96,8 t/ha E+I of the total 132,5 t/ha) compared with the best production in a_3 (Natupol), of 85.2%, meaning 106.7 t/ha E+Ist quality production of the total 125.3 t/ha;
- concluding, tomato production quality achieved, extra and Ist quality, is in inverse relationship to the amount realized production per hectare;
- of the four methods of stimulating flower fertilization, in terms of production quantity, the safest ranked first proved to be the method of biostimulation with Tomato-Stim (a_2), but it was on the last place in terms of production quality;
- in terms of production quality, the first place is the natural pollination with bumble-bees – Natupol (a_3), with 85.2% E+Ist quality (106.7 t/ha E+Ist quality of the total 125.3 t/ha), and the second of four methods, in terms of its quantitative production (109.9% than Mx_1);
- the method of stimulating flower fertilization a_4 (Bionex) is on the third place, both in terms of production quantity (112.7 t/ha – 98.9% than Mx_1), and production quality (74.0% → 83.4 t/ha of the total 112.7 t/ha).

In table 3 there are presented the results of the statistical calculation, and the production differences significances as a result of the interaction between the experimental factors.

Table 3. Unilateral and experimental factors' interactions impact upon determined growth tomato hybrids culture in cold solariums

Variant	Average production (kg/ha)		Relative production (%)	Difference (± t/ha)	Significance
1. Unilateral impact of the method of stimulating flower fecundation upon the production					
a2-a1	132,50	85,60	154,79	46,90	***
a3-a1	125,30	85,60	146,38	39,70	***
a4-a1	112,70	85,60	131,66	27,10	***
a3-a2	125,30	132,50	94,57	-7,20	000
a4-a2	112,70	132,50	85,06	-19,80	000
a4-a3	112,70	125,30	89,94	-12,60	000
DL 5%= 2,18 DL 1%= 3,30 DL 0,1%= 5,30					
2. Unilateral impact of the fertilization system upon the production					
b2-b1	122,43	105,63	115,91	16,80	***
DL 5%= 1,34 DL 1%= 1,84 DL 0,1% = 2,53					
3. Unilateral impact of the hybrid upon the production					
c2-c1	116,28	111,78	104,03	4,50	***
DL 5%= 1,54 DL 1%= 2,08 DL 0,1% = 2,78					
4. The impact of interaction between different methods of stimulating flower fecundation and the same or different fertilization systems upon the production					
a2b1-a1b1	124,40	78,70	158,07	45,70	***
a3b1-a1b1	114,90	78,70	146,00	36,20	***
a4b1-a1b1	104,50	78,70	132,78	25,80	***
a3b1-a2b1	114,90	124,40	92,36	-9,50	000
a4b1-a2b1	104,50	124,40	84,00	-19,90	000
a4b1-a3b1	104,50	114,90	90,95	-10,40	000
a2b2-a1b2	140,60	92,50	152,00	48,10	***
a3b2-a1b2	135,70	92,50	146,70	43,20	***
a4b2-a1b2	120,90	92,50	130,70	28,40	***
a3b2-a2b2	135,70	140,60	96,51	-4,90	00

a4b2-a2b2	120,90	140,60	85,99	-19,70	000
a4b2-a3b2	120,90	135,70	89,09	-14,80	000
a2b2-a1b1	140,60	78,70	178,65	61,90	***
DL 5% = 2,88 DL 1% = 4,17 DL 0,1% = 6,28					
5. The impact of interaction between the same method of stimulating flower fecundation and different fertilization systems upon the production					
a1b2- a1b1	92,50	78,70	117,53	13,80	***
a2b2- a2b1	140,60	124,40	113,02	16,20	***
a3b2- a3b1	135,70	114,90	118,10	20,80	***
a4b2- a4b1	120,90	104,50	115,69	16,40	***
DL 5% = 3,07 DL 1% = 4,16 DL 0,1% = 5,57					
6. The impact of interaction between the same method of stimulating flower fecundation and different hybrids upon the production					
a1c2- a1c1	87,90	83,30	105,52	4,60	***
a2c2- a2c1	135,30	129,70	104,32	5,60	***
a3c2- a3c1	128,10	122,50	104,57	5,60	***
a4c2- a4c1	113,80	111,60	101,97	2,20	*
DL 5% = 3,07 DL 1% = 4,16 DL 0,1% = 5,57					
7. The impact of interaction between the same fertilization system and different hybrids upon the production					
b1c2- b1c1	107,70	103,55	104,01	4,15	***
b2c2- b2c1	124,85	120,00	104,04	4,85	***
DL 5% = 2,17 DL 1% = 2,94 DL 0,1% = 3,94					
8. The impact of interaction between different fertilization systems and the same hybrid upon the production					
b2c1- b1c1	120,00	103,55	115,89	16,45	***
b2c2- b1c2	124,85	107,70	115,92	17,15	***
b2c2- b1c1	124,85	103,55	120,57	21,30	***
DL 5% = 2,04 DL 1% = 2,78 DL 0,1% = 3,76					
9. The impact of interaction between the same method of stimulating flower fecundation and the same fertilization system and different hybrids upon the production					
a1b1c2- a1b1c1	80,50	76,90	104,68	3,60	-
a2b2c2- a2b2c1	143,50	137,70	104,21	5,80	*
DL 5% = 4,35 DL 1% = 5,89 DL 0,1% = 7,87					
10. The impact of interaction between different methods of stimulating flower fecundation and the same fertilization system and the same hybrid upon the production					
a1b2c1- a1b1c1	89,70	76,90	116,64	12,80	***
a2b2c2- a2b1c2	143,50	127,10	112,90	16,40	***
DL 5% = 4,07 DL 1% = 5,56 DL 0,1% = 7,52					

From the analysis of point 1 – unilateral impact of stimulating flower fecundation method, it results that the productions determined by a_2 – Tomato-Stim, a_3 –Natupol, a_4 –Bionex, are statistically assured, the differences being significant positive and very significant negative in case of a_3 – Natupol than a_2 – Tomato-Stim, a_4 –Bionex than a_2 –Tomato-Stim and a_4 –Bionex than a_3 – Natupol).

Point 2, unilateral impact of fertilization systems upon the production, shows that the production determined by b_2 (Kemira) is statistically assured, the differences being very significant positive, with an increase of 15.9%.

From point 3 – unilateral impact of the hybrid upon the production – it results that the productions obtained from the two hybrids are statistically assured, the difference significance between c_2 – Maximus F1 and c_1 – Magnus F1 being very significant positive, showing that Maximus F1 (c_1) has superior quantitative features (125.7 t/ha than 121.3t/ha for c_1 – Magnus F1 compared to Mx_2; 116.3 t/ha than 111.8 t/ha compared to Mx_1), but also qualitative, things that also resulted from table 1 and figure 1.

From points 4-10 in table 3 it results that according to bi or trifactorial combinations, the production differences' significances are very diversified, covering the full range of appraisal (very significant positive or negative, distinct significant positive or negative and significant positive or negative), which shows the intensity of experimental factors' interactions upon the obtained quantitative and qualitative productions.

CONCLUSIONS

1. The application to our experiment of multiple methods to stimulate flowers' fertilization, some of which have been considered support and increased performance of pollination, natural fertilization of the flowers, and others to replace them by outside plant intake of artificial substances, resulted in the production of differentiated unilateral or combined influence of other experimental factors (fertilization system with different types of modern fertilizers and the hybrid)

2. A unilateral decisive influence factor (method of stimulating flower fertilization) on tomato production quantitatively and qualitatively, was not carried out only by a single graduation, so graduation a_2 (Tomato-Stim stimulation) expressed its effect on the level of production quantity and graduation a_3 (natural pollination by bumble-bees - Natupol) on its quality level.

3. Under the impact of a_2 (Tomato-Stim) we obtained the highest tomato production in the experiment, of 132.5 t/ha (154.8% than a_1 – natural pollination), on the second place being the production determined by a_3 (natural pollination by bumble-bees – Natupol), of 125.3 t/ha (146.4% than a_1 – natural pollination), being followed by the productions in a_4 (biostimulation with Bionex) and last a_1 (natural pollination).

4. Considering the quality of obtained productions we can an occurrence of the inverse effect, the largest productions under the influence of a_2 (Tomato-Stim), of 132.5 t/ha, corresponds to the lowest rate of production of extra and Ist quality, of 73.1% of the total production (108.0% and 101 .3% compared to Mx_1 respectively Mx_2).

5. The largest share of production of extra and Ist quality is recorded under the impact of graduation a_3 (Natupol), of 85.2% - 106.7 t/ha of the total 125.3 t /ha (119.1% and 111.6% compared to Mx_1 respectively Mx_2), being followed by 83.6% - 71.6 t/ha in a_1 (natural pollination) and 74.0% - 83.4 t/ha in a_4 (biostimulation with Bionex).

6. Hierarchy of production levels achieved in terms of quality with top filling (I and II) under the impact of a_3 (natural pollination by bumble-bees - Natupol) and a_1 (natural pollination), fertilization stimulation involving the naturally pollinated flowers, is explained by the influence exerted by the aforementioned phenomenon of fruit quality in terms of physical characteristics (size, weight, color, etc.) and the chemical and organoleptic features (taste, smell, etc.).

7. The productions obtained after using Kemira fertilization system (b_2) are with 15.5% up to 15.9% higher than those obtained after using Agriplant fertilization system (b_1):

- the average production Mx_1b_2 is of 122.4 t/ha, meaning 115.9% than Mx_1b_1 and of 115.5% than Mx_2b_1, while Mx_1b_1 is of 105.6 t/ha, meaning 92.6% than Mx_1 and of 114.6 t/ha , meaning 92.8 %, than Mx_2.
- The average production Mx_2b_2 is of 132.4 t/ha, meaning 107.2% than Mx_2, and Mx_2b_1 is of 114.6 t/ha, meaning 92.8% than Mx_2.

8. Both hybrids, Magnus F1 and Maximus F1 proved to be valuable both in terms of quantity production level achieved and the Extra and Ist quality percentage of the average yield achieved, the quality of the productions made by the two hybrids compared to the two average values of the experiment vary in the following intervals:

- Magnus F_1 (c_1) – 111.8 -121.3 t/ha, of which 86.0-91.7 t/ha E+I quality production, meaning 76.9-75.6 %;
- Maximus F_1 (c_2) – 116.3-125.7 t/ha, of which 93.3-99.5 t/ha E+I quality production, meaning 80.2-79.2%.

9. We recommend further research to strengthen the conclusions of the experiment.

REFERENCES

[1]. Horgoş, A., Oglejan, Doina., Kondor, F., Becherescu, Alexandra, 2002. *On the influence of kemira-type fertilising on the quantitative and qualitative levels of tomato yields in unheated solaria,* Vol. Lucrări Ştiinţifice seria B (XLV) 2002, ISSN1222-5312, Bucureşti.

[2]. Horgoş A., Oglejan Doina, Bulboacă T., 2001. *Studies on unheated solarium tomato yield efficientialisation.* Vol. Lucrări Ştiinţifice seria B (XLIV) 2001, ISSN 1222-5312, Bucureşti.

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