THE INFLUENCE OF ORGANIC FERTILIZATION ON ECOLOGICAL TOMATOES FROM POLYTUNNELS IN A THREE YEARS STATIONARY EXPERIMENTAL PLOT

INFLUENȚA FERTILIZĂRII ORGANICE LA O CULTURĂ ECOLOGICĂ DE TOMATE ÎN SOLAR, ÎNTR-UN STAȚIONAR EXPERIMENTAL DE TREI ANI

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Abstract. *Research was carried out in an experimental stationary of tomatoes crop cultivated in polytunnels at Spataresti-Falticeni, during 2003-2005 periods. Results showed that by using different types organic fertilizers it can be obtained significant yield positive differences, at early and total yields. The highest yields were obtained by applying a quantity of 40 t/ha mature compost.*

Rezumat. *Cercetările au fost realizate într-un staționar experimental de tomate cultivate în solarii, la Spătărești-Fălticeni, în perioada 2003-2005. Rezultatele au demonstrat că prin folosirea diferitelor tipuri de îngrășământ organic, se obțin sporuri de producție, atât la cultura timpurie, cât şi la cea totală, indiferent de cultivarul de tomate folosit. Cele mai mari producții au fost obținute în variantele fertilizate cu compost matur, în cantitate de 40 t/ha.*

The aim of the experience was to determine the influence of the interaction of the organic manure type x dose about the total yield of tomatoes, in polytunnels, from conversion period and organic exploitation

MATERIAL AND THE METHOD

The experience was organized by three factors (3A x 3B x 2C), in a device of subdivided plots with 18 variants, in three repetitions. The A factor with three level is represented type of variety (A1-Belle F1, A2-Bakony F1, A3-Arletta F1). The B factor is represented by organic manure (B_1 - organic manure from extensive farms, B_2 - compost, B_3 - semi fermented manure horned cattle). The third factor with two level represented dose of manure (C_1 - 30 t/ha, C_2 - 40 t/ha).

The experimental surface was of 9 sm, accordingly 2,47 plants/sm. The number of the total experiment was of 54. The experimental variants have been planted in individual polytunnels of 262 sm, respectively 270 sm each. The planting had been accomplished in 2003 on 21 April, in 2004 on 17 April and in 2005 on 18 April. For establishment has been used seedling produced in pots from plastic of 340 cm^3, with age of 50-56 days. The seed and the seedlings were treatise only with admitted products (CEE Regl. 2092/1991). For the crop establishment had been used

the crop scheme of 90 cm x 45 cm, resulting a density of 24691 plants. The seedlings were produced in their own farm in a polytunnel from policarbonat.

The yield was recorded in dynamics from June to September. The early production was considered for North-East region, to be that production which is achieved up to 31 July (**Stan**, 1985).

The experimentally dates were processed through the analysis of variance (**Săulescu**, 1967), the signification of the differences being estimated through the limit differences, through the comparison of the studied factors or the combinations of them (**Jităreanu**, 1994).

RESULTS AND DISCUSSIONS

1) The influence of the interaction of the organic manure type x dose about the total production in the case of Belle variety (table 1) shows as following:

a) the highest production in the first year of conversion was obtained in the case of the variant fertilized with 40 t/ha of compost;

b) insured statistical efficiencies of 99,9 % about the production are obtained in the year 2004, through comparing the variants : b_2c_2 cu b_1c_1, b_3c_2 cu b_1c_1, b_1c_2 cu b_1c_1 and b_2c_2 cu b_2c_1;

c) the best production in 2005 was obtained through fertilization with compost x 40 t/ha (66,8 t/ha). Very significant positive differences are obtained through comparing the variants : b_3c_2 cu b_3c_1 (4,4 t/ha), b_2c_2 cu b_2c_1 (4,3 t/ha), b_3c_2 cu b_1c_1 (4,0 t/ha), b_3c_2 cu b_2c_1 (3,8 t/ha), b_1c_2 cu b_1c_1 (3,3 t/ha), b_3c_1 cu b_1c_2 (3,7 t/ha) si b_2c_1 cu b_1c_2(3,1 t/ha);

d) the highest total production in period of experimentation has been obtained in the same variant, the difference of the b_1c_1 variant being of 4,6 t/ha, insured statistical 99,9 %.

2) The results of production in the case of the Bakony cultivar (table 2), through the interaction of the factors manure x dose, show as following:

a) in 2004, the best yield was obtained by the variant fertilized with 40 t/ha of compost. Insured statistical efficiencies of 99,9 % are obtained through comparing the variants : b_3c_2 cu b_1c_1 (3,6 t/ha), b_2c_2 cu b_1c_2 (3,0 t/ha) and b_2c_1 cu b_1c_1 (2,8 t/ha). From this dates, we can notice that the dose of manure influenced major the production.

b) the total yield in the case of Bakony hybrid rised from 61,4 t/ha (b_1c_1) to 63,4 t/ha (b_2c_2). Insured statistical efficiencies of 99 % are obtained through comparing the variants: b_3c_2 cu b_1c_1 (2,0 t/ha), b_2c_2 cu b_1c_2 (1,5 t/ha) and b_3c_2 cu b_1c_2 (1,5 t/ha);

c) in the first year of certification, the production rised from 61,2 t/ha (b_1c_1) to 65,9 t/ha (b_2c_2). Very significant positive differences are obtained through comparing the variants : b_3c_2 cu b_1c_1 (3,4 t/ha), b_2c_2 cu b_2c_1 (3,1 t/ha), b_3c_2 cu b_3c_1 (2,9 t/ha), b_1c_2 cu b_1c_1 (2,4 t/ha), b_2c_2 cu b_1c_2 (2,3 t/ha), b_3c_2 cu b_2c_1 (1,8 t/ha) and b_2c_1 cu b_1c_1(1,6 t/ha). From the dates presented we can notice that the major factor that influenced the harvest is the amount of manure used.

Table1

Tomatoes production results, when using Belle cultivar, in ecological system

Factors	Experimental year											
	2003			2004			2005			2003-2005		
	Yield (t/ha)	Difference (t/ha)	Significance	Yield (t/ha)	Difference (t/ha)	Significance	Yield (t/ha)	Difference (t/ha)	Significance	Yield (t/ha)	Difference (t/ha)	Significance
$b_1c_2 - b_1c_1$	63,1-59,6	3,5	***	63,5-60,6	2,9	***	65,6-62,3	3,3	***	64,0-60,8	3,2	***
$b_2c_1 - b_1c_1$	61,4-59,6	1,8	**	62,4-60,6	1,8	**	62,5-62,3	0,2		62,1-60,8	1,3	**
$b_2c_2 - b_1c_1$	64,3-59,6	4,7	***	65,0-60,6	4,4	***	66,8-62,3	4,5	***	65,4-60,8	4,6	***
$b_3c_1 - b_1c_1$	60,2-59,6	0,6		62,5-60,6	1,9	**	61,9-62,3	-0,4		61,5-60,8	0,7	
$b_3c_2 - b_1c_1$	62,3-59,6	2,7	***	63,7-60,6	3,1	***	66,3-62,3	4,0	***	64,1-60,8	3,3	***
$b_2c_1 - b_1c_2$	61,4-63,1	-1,7	oo	62,4-63,5	-1,1	o	62,5-65,6	-3,1	ooo	62,1-64,0	-1,9	ooo
$b_2c_2 - b_1c_2$	64,3-63,1	1,2	*	65,0-63,5	1,5	**	66,8-65,6	1,2	**	65,4-64,0	1,4	**
$b_3c_1 - b_1c_2$	60,2-63,1	-2,9	ooo	62,5-63,5	-1,0		61,9-65,6	-3,7	ooo	61,5-64,0	-2,5	ooo
$b_3c_2 - b_1c_2$	62,3-63,1	-0,8		63,7-63,5	0,2		66,3-65,6	0,7		64,1-64,0	0,1	
$b_2c_2 - b_2c_1$	64,3-61,4	2,9	***	65,0-62,4	2,6	***	66,8-62,5	4,3	***	65,4-62,1	3,3	***
$b_3c_1 - b_2c_1$	60,2-61,4	-1,2	o	62,5-62,4	0,1		61,9-62,5	-0,6		61,5-62,1	-0,6	
$b_3c_2 - b_2c_1$	62,3-61,4	0,9		63,7-62,4	1,3	*	66,3-62,5	3,8	***	64,1-62,1	2,0	***
$b_3c_1 - b_2c_2$	60,2-64,3	-4,1	ooo	62,5-65,0	-2,5	ooo	61,9-66,8	-4,9	ooo	61,5-65,4	-3,9	ooo
$b_3c_2 - b_2c_2$	62,3-64,3	-2,0	oo	63,7-65,0	-1,3	o	66,3-66,8	-0,5		64,1-65,4	-1,3	oo
$b_3c_2 - b_3c_1$	62,3-60,2	2,1	**	63,7-62,5	1,2	*	66,3-61,9	4,4	***	64,1-61,5	2,6	***
	DL 5% = 1,2 t/ha DL 1% = 1,6 t/ha DL 0,1% = 2,3 t/ha			DL 5% = 1,1 t/ha DL 1% = 1,5 t/ha DL 0,1% = 2,1 t/ha			DL 5% = 0,8 t/ha DL 1% = 1,1 t/ha DL 0,1% = 1,5 t/ha			DL 5% = 0,8 t/ha DL 1% = 1,1 t/ha DL 0,1% = 1,5 t/ha		

Table2

Tomatoes production results, when using Bakony cultivar, in ecological system

Factors	Experimental year											
	2003			2004			2005			2003-2005		
	Yield (t/ha)	Difference (t/ha)	Significance	Yield (t/ha)	Difference (t/ha)	Significance	Yield (t/ha)	Difference (t/ha)	Significance	Yield (t/ha)	Difference (t/ha)	Significance
$b_1c_2 - b_1c_1$	60,5-58,7	1,8	**	61,9-61,4	0,5		63,6-61,2	2,4	***	62,0-60,4	1,6	***
$b_2c_1 - b_1c_1$	61,5-58,7	2,8	***	62,4-61,4	1,0		62,8-61,2	1,6	***	62,2-60,4	1,8	***
$b_2c_2 - b_1c_1$	63,5-58,7	4,8	***	63,4-61,4	2,0	**	65,9-61,2	4,7	***	64,3-60,4	3,9	***
$b_3c_1 - b_1c_1$	60,6-58,7	1,9	**	62,4-61,4	1,0		61,7-61,2	0,5		61,6-60,4	1,2	**
$b_3c_2 - b_1c_1$	62,3-58,7	3,6	***	63,4-61,4	2,0	**	64,6-61,2	3,4	***	63,4-60,4	3,0	***
$b_2c_1 - b_1c_2$	61,5-60,5	1,0		62,4-61,9	0,5		62,8-63,6	-0,8		62,2-62,0	0,2	
$b_2c_2 - b_1c_2$	63,5-60,5	3,0	***	63,4-61,9	1,5	**	65,9-63,6	2,3	***	64,3-62,0	2,3	***
$b_3c_1 - b_1c_2$	60,6-60,5	0,1		62,4-61,9	0,5		61,7-63,6	-1,9	ooo	61,6-62,0	-0,4	
$b_3c_2 - b_1c_2$	62,3-60,5	1,8	**	63,4-61,9	1,5	**	64,6-63,6	1,0	*	63,4-62,0	1,4	**
$b_2c_2 - b_2c_1$	63,5-61,5	2,0	**	63,4-62,4	1,0		65,9-62,8	3,1	***	64,3-62,2	2,1	***
$b_3c_1 - b_2c_1$	60,6-61,5	-0,9		62,4-62,4	0,0		61,7-62,8	-1,1	oo	61,6-62,2	-0,6	
$b_3c_2 - b_2c_1$	62,3-61,5	0,8		63,4-62,4	1,0		64,6-62,8	1,8	***	63,4-62,2	1,2	**
$b_3c_1 - b_2c_2$	60,6-63,5	-2,9	ooo	62,4-63,4	-1,0		61,7-65,9	-4,2	ooo	61,6-64,3	-2,7	ooo
$b_3c_2 - b_2c_2$	62,3-63,5	-1,2	o	63,4-63,4	0,0		64,6-65,9	-1,3	oo	63,4-64,3	-0,9	o
$b_3c_2 - b_3c_1$	62,3-60,6	1,7	**	63,4-62,4	1,0		64,6-61,7	2,9	***	63,4-61,6	1,8	***

DL 5% = 1,2 t/ha	DL 5% = 1,1 t/ha	DL 5% = 0,8 t/ha	DL 5% = 0,8 t/ha
DL 1% = 1,6 t/ha	DL 1% = 1,5 t/ha	DL 1% = 1,1 t/ha	DL 1% = 1,1 t/ha
DL 0,1% = 2,3 t/ha	DL 0,1% = 2,1 t/ha	DL 0,1% = 1,5 t/ha	DL 0,1% = 1,5 t/ha

Table3

Tomatoes production results, when using Arletta cultivar, in ecological system

Factors	Experimental year											
	2003			2004			2005			2003-2005		
	Yield (t/ha)	Difference (t/ha)	Significance	Yield (t/ha)	Difference (t/ha)	Significance	Yield (t/ha)	Difference (t/ha)	Significance	Yield (t/ha)	Difference (t/ha)	Significance
$b_1c_2 - b_1c_1$	60,3-57,5	2,8	***	61,1-58,4	2,7	***	61,0-60,3	0,7		60,8-58,7	2,1	***
$b_2c_1 - b_1c_1$	57,1-57,5	-0,4		58,3-58,4	-0,1		61,8-60,3	1,5	***	59,1-58,7	0,4	
$b_2c_2 - b_1c_1$	59,3-57,5	1,8	**	61,1-58,4	2,7	***	62,4-60,3	2,1	***	60,9-58,7	2,2	***
$b_3c_1 - b_1c_1$	56,8-57,5	-0,7		58,4-58,4	0,0		61,7-60,3	1,4	**	59,0-58,7	0,3	
$b_3c_2 - b_1c_1$	59,4-57,5	1,9	**	60,1-58,4	1,7	**	63,1-60,3	2,8	***	60,9-58,7	2,2	***
$b_2c_1 - b_1c_2$	57,1-60,3	-3,2	ooo	58,3-61,1	-2,8	ooo	61,8-61,0	0,8	*	59,1-60,8	-1,7	ooo
$b_2c_2 - b_1c_2$	59,3-60,3	-1,0		61,1-61,1	0,0		62,4-61,0	1,4	**	60,9-60,8	0,1	
$b_3c_1 - b_1c_2$	56,8-60,3	-3,5	ooo	58,4-61,1	-2,7	ooo	61,7-61,0	0,7		59,0-60,8	-1,8	ooo
$b_3c_2 - b_1c_2$	59,4-60,3	-0,9		60,1-61,1	-1,0		63,1-61,0	2,1	***	60,9-60,8	0,1	
$b_2c_2 - b_2c_1$	59,3-57,1	2,2	**	61,1-58,3	2,8	***	62,4-61,8	0,6		60,9-59,1	1,8	***
$b_3c_1 - b_2c_1$	56,8-57,1	-0,3		58,4-58,3	0,1		61,7-61,8	-0,1		59,0-59,1	-0,1	
$b_3c_2 - b_2c_1$	59,4-57,1	2,3	***	60,1-58,3	1,8	**	63,1-61,8	1,3	**	60,9-59,1	1,8	***
$b_3c_1 - b_2c_2$	56,8-59,3	-2,5	ooo	58,4-61,1	-2,7	ooo	61,7-62,4	-0,7		59,0-60,9	-1,9	ooo
$b_3c_2 - b_2c_2$	59,4-59,3	0,1		60,1-61,1	-1,0		63,1-62,4	0,7		60,9-60,9	0,0	
$b_3c_2 - b_3c_1$	59,4-56,8	2,6	***	60,1-58,4	1,7	**	63,1-61,7	1,4	**	60,9-59,0	1,9	***

DL 5% = 1,2 t/ha	DL 5% = 1,1 t/ha	DL 5% = 0,8 t/ha	DL 5% = 0,8 t/ha
DL 1% = 1,6 t/ha	DL 1% = 1,5 t/ha	DL 1% = 1,1 t/ha	DL 1% = 1,1 t/ha
DL 0,1% = 2,3 t/ha	DL 0,1% = 2,1 t/ha	DL 0,1% = 1,5 t/ha	DL 0,1% = 1,5 t/ha

d) for total production, insured statistical efficiencies of 99% are obtained through comparing the variants : b_3c_2 cu b_1c_1 (3,0 t/ha), b_2c_2 cu b_1c_2 (2,3 t/ha), b_2c_2 cu b_2c_1 (2,1 t/ha), b_2c_1 cu b_1c_1 (1,8 t/ha), b_3c_2 cu b_3c_1 (1,8 t/ha) and b_1c_2 cu b_1c_1(1,6 t/ha).

3) The influence of the interaction of organic manure x dose in the case of Arletta hybrid (table 3) demonstrates that the highest production in 2003 was obtained through the fertilization with manure from extensive farms x 40 t/ha (61,3 t/ha). Very significant differences are obtain through comparing the variants : b_2c_1 cu b_1c_2 (3,2 t/ha), b_3c_2 cu b_3c_1 (2,6 t/ha), b_3c_1 cu b_2c_2 (2,5 t/ha) and b_3c_2 cu b_2c_1 (2,3 t/ha). From the dates presented, we can notice that the factors of compost and semifermented manure assures harvests very significant against manure from extensive farms , through utilization the same amounts.

For the total production in 2005, the best results are obtained in the variant b_2c_2 (63,1 t/ha). Other very significant positive differences are obtained through comparing the variants: b_2c_2 cu b_1c_1 (2,1 t/ha), b_3c_2 cu b_1c_2 (2,1 t/ha) and b_2c_1 cu b_1c_1 (1,5 t/ha). The results presented for the period 2003-2005 show as the best results of production in the experimental period are obtained in the variants fertilized with compost and semi fermented manure in amount of 40 t/ha, differences from 1,9 t/ha up to 2,5 t/ha, against the other experimental variants.

CONCLUSIONS

(1) The highest Belles` total production in period of experimentation has been obtained in the variant fertilized with 40 t/ha compost; the difference of the b_1c_1 variant being of 4,6 t/ha, insured statistical 99,9 %.

(2) For total production on Bakony F1 variety , insured statistical efficiencies of 99% are obtained through comparing the variants : b_3c_2 cu b_1c_1 (3,0 t/ha), b_2c_2 cu b_1c_2 (2,3 t/ha), b_2c_2 cu b_2c_1 (2,1 t/ha), b_2c_1 cu b_1c_1 (1,8 t/ha), b_3c_2 cu b_3c_1 (1,8 t/ha) and b_1c_2 cu b_1c_1(1,6 t/ha).

(3) The results presented for the period 2003-2005 show as the best results of production in the experimental period at Arletta F1 hybrid are obtained in the variants fertilized with 40 t/ha compost and semi fermented manure, differences from 1,9 t/ha up to 2,5 t/ha, against the other experimental variants.

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