

RESEARCHES CONCERNING PLANT DIRECTING METHOD AND FERTILIZATION METHOD ON EGG PLANTS CULTIVATED IN PLASTIC TUNNELS

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Abstract. The aim and the objectives of the experiments effectuated at the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Romania, was to establish the best plant directing method and the fertilization method for egg plants cultivated in plastic tunnel covered with durable polyethylene film in a less favourable area. During the experience the following observations have been done: crop dynamic; early and total yield; fruit quality. The directing method of plants influences both early and total yield. So, for the variants with plants directed with 3 branches the yield increase was 58.6% for early yield and 7.5% for the total yield comparative with the variants with undirected plants. Fertilization method influenced mostly the early yield. For the weekly fertilization the yield difference was significant positive given the control (monthly fertilization). If we take in consideration the total yield variants with weekly fertilization had a yield increase about 9.2% given the control but the yield differences were not assured statistically. Under the combined influence of factors the best results, for both early and total yield, were obtained by the variants with plant directed with 2 respectively 3 branches and weekly fertilization.

Key words: egg plants, plastic tunnels, directing method, fertilization

INTRODUCTION

In the references are mentioned only few data about plant density, directing method and fertilization for polyethylene greenhouse egg plants culture. Vogel and Lanckow (1991) had studied different plant density but maintaining the same number of fruits on square meter. The yield was with 23% higher when plant density was 16000 plants/hectare comparative with the variants with 25000 plants/hectare. Chaux and Foury (1994) recommend for polyethylene film greenhouse egg plants culture plant densities between 10000-25000 plants/ha. When plant density is lower the number of branches/plant is higher (approximately 4). With the increasing of density the number of branches is smaller (1-2 branches/plant). Apahidean (2003) as well as Ciofu et al. (2003) recommend directing the egg plants cultivated in polyethylene greenhouse with 1-3 branches in accordance with plant density and foliar fertilization at 20-25 days. Voican and Lăcătuș (1998) mention that plant density should be 33000-35000 plants/hectare, directed with 2-3 branches in accordance with the vigour of the variety or hybrid and with foliar fertilization at 15 days.

MATERIAL AND METHODS

In the experience it has been used the egg plant hybrid F₁ Madona, produced by Duch company De Ruiters Seeds. This hybrid, called by the producer “queen of egg plants” is

recommended for under protection culture. Plants are very vigorous and have a very well developed root system. Fruits are black, with few seeds and white pulp. The weight of fruit is about 350-400 g.

In order to establish the technological sequences for egg plant cultivated in plastic tunnels, a bifactorial experience has been organized in 2005, at the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Romania.

Factor A = plant directing method, with: a₁- undirected; a₂ - directed with 2 branches; a₃- directed with 3 branches.

Factor B = method of fertilization, with: b₁- monthly fertilization; b₂- weekly fertilization.

By factors combination had results 6 experimental variants. The surface of experimental plot was 6 m² resulting a surface of 108 m² for the whole experience. The culture has been established in 20.04.2006 and it ended at 16.10.2006, and the experimental variants are presented in the Table 1.

Table 1

Experimental variants, Cluj-Napoca, 2005

Variant	Directing method	Fertilization
I a ₁ b ₁	undirected	monthly fertilization
II a _a b ₂	undirected	weekly fertilization
III a ₂ b ₁	directed with 2 branches	monthly fertilization
IV a ₂ b ₂	directed with 2 branches	weekly fertilization
V a ₃ b ₁	directed with 3 branches	monthly fertilization
VI a ₃ b ₂	directed with 3 branches	weekly fertilization

The culture was established with seedling produced, in cubes with the side 7 cm. for all variants the plant density was 30000 plants/ha.

During vegetation period the culture was fertilized with the same quantity (240 kg/month) of Complex III (15:15:15) fertilizer. The fertilized was applied differently: monthly for the variant I, III, and V and weekly for variants II, IV, VI (60 kg/ha).

In the case of variants I and II plants were permitted to grow free with no special interventions. Plants from variants II and IV were conducted with 2 branches and those from variant V and VI with 3 branches, all the others sprouts were tweaked after the first flower.

RESULTS AND DISCUSSIONS

Crop dynamic

For the experiments effectuated in 2005 the harvesting of egg plants started in the first the days of July for all variants and finished in the second decade of October.

Regarding crop dynamic (Table 2) it can be noticed that variant VI (plants directed with 3 branches and fertilized weekly) had a superior evolution comparative to the others variants during almost the all period of vegetation.

Comparative to the control (variant I, plants undirected with monthly fertilization) all the others variants have better results.

Early yield

Analyzing the influence of fertilization on the early yield (at 31.07.2005) at tomatoes cultivated in plastic tunnels (Table 3) it can be noticed that for variants with weekly fertilization the yield difference given the control (monthly fertilization) was significant positive.

Table 2

Crop dynamic to egg plants cultivated in plastic tunnels

Variants	July				August				September				October			Total yield
	I	II	III	Total	I	II	III	Total	I	II	III	Total	I	II	Total	
I	0.45	0.63	0.89	1.97	1.43	1.20	1.08	3.71	0.45	0.38	0.30	1.13	0.57	0.34	0.91	7.72
II	0.88	0.81	0.44	2.13	1.94	1.02	0.78	3.74	0.50	0.41	0.31	1.22	0.45	0.28	0.73	7.82
III	0.71	0.58	0.45	1.74	1.67	1.28	0.96	3.91	0.48	0.52	0.49	1.49	0.49	0.29	0.78	7.92
IV	0.94	0.89	0.54	2.37	1.83	1.54	0.92	4.29	0.57	0.45	0.24	1.26	0.54	0.33	0.87	8.79
V	0.85	0.63	0.49	1.97	1.58	1.28	0.99	3.85	0.28	0.47	0.29	1.04	0.49	0.35	0.84	7.70
VI	0.86	1.13	0.97	2.96	1.55	1.23	0.92	3.70	0.53	0.34	0.44	1.31	0.51	0.39	0.90	8.87

Table 3

Unilateral influence of fertilization on early yield (31 July) for egg plants cultivated in plastic tunnels

Variant	Early yield (kg/m ²)	%	Difference	Signification of difference
Monthly fertilization	1.83	100.0	-	-
Weekly fertilization	2.67	146.5	+0.85	*
DL	5%		0.56	
	1%		1.30	
	0.1%		4.14	

Regarding the influence of plant directing method on the egg plant early yield (Table 4) experimental variants directed with 2 branches had a yield increase about 33.5%, distinct significant positive given the control (undirected plants). Variants directed with 3 branches had a yield increase about 58.6%, very significant positive given the control.

Table 4

Unilateral influence of plant directing method on early yield (31 July) for egg plants cultivated in plastic tunnels

Variant	Early yield (kg/m ²)	%	Difference	Signification of difference
Undirected	1.72	100.0	-	-
Directed with 2 branches	2.30	133.5	+0.58	**
Directed with 3 branches	2.73	158.6	+1.01	***
DL	5%		0.36	
	1%		0.52	
	0.1%		0.78	

If we analyze the early yield of egg plants cultivated in plastic tunnel under the combine influence of both factors (Table 5) we can notice that variants IV (2 branches, weekly fertilization) and VI (3 branches, weekly fertilization) registered a yield difference very significant positive given the control (variant I- undirected plants, monthly fertilization).

Variants II (undirected plants, weekly fertilization) and V (3 branches, monthly fertilization) had a yield increase distinct significant given the control.

Table 5

Combined influenced of both factors on early yield (31 July) for egg plants cultivated in plastic tunnels

Variant	Early yield (kg/m ²)	%	Difference	Signification of difference
V _I	1.31	100.0	-	-
V _{II}	2.13	162.6	+0.82	**
V _{III}	2.02	154.2	+0.71	*
V _{IV}	2.58	196.9	+1.27	***
V _V	2.15	164.1	+0.84	**
V _{VI}	3.31	252.7	+2.00	***
DL	5%		0.51	
	1%		0.74	
	0.1%		1.10	

Total yield

Analyzing the unilateral influence of fertilization method on total yield of egg plant cultivated in plastic tunnels (Table 6) it can be noticed there are no major differences between monthly and weekly fertilization. So, the yield for experimental variants with monthly fertilization was 7.78 and for variants with weekly fertilization were 8.44, the yield increase about 9.2% had been not statically provided.

Table 6

Unilateral influence of fertilization on total yield for egg plants cultivated in plastic tunnels

Variant	Early yield (kg/m ²)	%	Difference	Signification of difference
Monthly fertilization	7.78	100.0	-	-
Weekly fertilization	8.49	109.2	+0.71	-
DL	5%		1.29	
	1%		2.97	
	0.1%		9.47	

Regarding the influence of plant directing method on total yield (Table 7) it can be noticed that experimental variants directed with 3 branches registered a yield difference significant positive given the variants with undirected plants.

Experimental variants directed with 2 branches had a yield increase about 6.6% given the undirected variants but the difference was not statistically provided.

Table 7

Unilateral influence of plant directing method on total yield for egg plants cultivated in plastic tunnels

Variant	Early yield (kg/m ²)	%	Difference	Signification of difference
Undirected	7.77	100.0	-	-
Directed with 2 branches	8.28	106.6	+0.51	-
Directed with 3 branches	8.35	107.5	+0.58	*
DL	5%		0.57	
	1%		0.83	
	0.1%		1.25	

Analyzing the combined influence of both factors on total yield (Table 8) it can be noticed that variant with plants directed with 2 branches and weekly fertilization (variant IV) and variant with plants directed with 3 branches and weekly fertilization (variant VI) obtained yield differences significant positive given the control (variant 1). Yield differences registered by the others experimental variants are not statistically provided.

Table 8

Combined influenced of both factors on total yield for egg plants cultivated in plastic tunnels

Variant	Early yield (kg/m ²)	%	Difference	Signification of difference
V _I	7.72	100.0	-	-
V _{II}	7.82	101.3	+0.10	-
V _{III}	7.92	102.6	+0.20	-
V _{IV}	8.79	113.9	+1.07	*
V _V	7.70	99.7	-0.02	-
V _{VI}	8.87	114.9	+1.15	*
DL	5%		0.81	
	1%		1.18	
	0.1%		1.77	

Quality of production

From the commercial analyze of production results that Ist quality fruits represents between 73.4% and 82.9% (Table 9). Variant VI (plants directed with 3 branches and weekly fertilization) realized most of the Ist quality fruits, respectively 7.36 kg/m².

Table 9

Commercial quality of egg plants cultivated in plastic tunnel yield

Variant	Yield (kg/m ²)			% I st quality fruits	
	Total	I st quality	II nd quality	From total	Comparative to the control
V _I	7.72	5.67	2.05	73.4	100.0
V _{II}	7.82	5.85	1.97	74.8	103.2
V _{III}	7.92	6.35	1.57	80.1	111.9
V _{IV}	8.79	7.23	1.56	82.2	127.5
V _V	7.70	6.20	1.50	80.5	109.3
V _{VI}	8.87	7.36	1.51	82.9	129.8

Comparative to the control, the highest volume of Ist quality fruits is realized by the variant VI with 129.9% due to the highest yield of this variant.

CONCLUSIONS

After the experiment effectuated in 2005 on the plastic tunnel egg plant culture the following conclusions can be inferred:

The best crop dynamic for almost the whole period of vegetation has been registered for variant VI (plants directed with 3 branches and weekly fertilization).

The early yield was influenced by both the fertilization method and plant directing method. So, the variants fertilized weekly had a yield increase about 46.5% given the variants fertilized monthly due to a more rhythmic supply with nutritive elements during a period when root system of plants it is not very well developed. Directing plants with 2 or 3 branches assure yield differences distinct significant positive respectively very significant positive given the control (variants with undirected plants). By taking in consideration the combined influence of factors the highest early yields were obtained for variants IV and VI, fertilized weekly and with plants directed with 2 respectively 3 branches.

Total yield was not significantly influenced by fertilization method. Still, variants fertilized weekly had a yield increase about 9.2% comparative to variants with monthly fertilization.

Regarding the influence of directing method of plants on the total yield variants with plants directed with 3 branches have a significant yield increase given the control (variants with undirected plants). In the case of total yield under the combined influence of factors the results obtained are conforming to those registered for the early yield. Variants IV and VI realized a significant yield increase given the control (monthly fertilization and undirected plants).

For variants with plants directed with 2 respectively 3 branches the percent of Ist quality fruits is between 80.1% and 82.9%, with major differences between variants. Variants I and II with undirected plants have a lower percent of Ist quality fruits (73.4% respectively 74.8%).

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REZUMAT

CERCETĂRI PRIVIND MODUL DE CONDUCERE ȘI REGIMUL DE FERTILIZARE LA VINETELE CULTIVATE ÎN SOLARII

În experiențele efectuate în anul 2005, la Universitatea de Științe Agricole și Medicină Veterinară Cluj-Napoca, România, într-un solar de tip tunel, s-a urmărit modul de conducere a vinetelor, precum și modul de fertilizare a acestora, într-o zonă mai puțin favorabilă pentru cultura acestei specii. În experiență au fost efectuate următoarele observații și determinări: dinamica recoltărilor, producția timpurie și totală și calitatea fructelor. Variantele la care plantele au fost conduse cu trei brațe au înregistrat sporuri de producție de 58,6% în cazul producției timpurii și de 7,5% în cazul producției totale față de variantele la care nu s-a intervenit asupra plantelor prin lucrări de dirijare a creșterii și fructificării. Modul de fertilizare a influențat îndeosebi producția timpurie, obținându-se în cazul fertilizărilor săptămânale diferențe de producție semnificativ pozitive față de fertilizările lunare. În cazul producției totale, fertilizările săptămânale au asigurat un spor de producție de 9,2% față de cele lunare, fără ca diferența de producție să fie asigurată statistic. Atât în cazul producției timpurii cât și a producției totale, sub influența combinată a factorilor, cele mai bune rezultate au fost obținute de variantele a căror plante au fost conduse cu două și respectiv trei brațe, fertilizate săptămânal.