RESEARCH ON THE PHASIAL FERTILISATION OF ORGANIC EGGPLANTS CULTIVATED IN GREENHOUSES

Cărbunar Mihai*, Popovici Mariana*, Ienciu Andrada*

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea; Romania, e-mail:carbunar@yahoo.com

Abstract

Eggplants are vegetables from the Solanaceae family, pretentious in what the vegetation factors are concerned. The fruits are rich in vitamins, mineral salts and active principles beneficial to the human body, being able to prevent certain diseases.

The ecological technology of the culture implies an increased attention related to the vegetation factors management and related to the management of fertilization, a special attential has to be drawn to the phasial fertilization which is an important link in the technology of the culture.

Even if they are not eaten raw eggplants are very much appreciated by their consumers, due to the gastronomical delicacies that can be prepared from them.

The study related to the phasial fertilization of the eggplant cultures cultivated in greenhouses in an ecological system has been performed in a vegetable micro farm, ecologically certified, in 8 variants with 3 repetitions, from which 1 non fertilized variant and 7 variants phasially fertilized at different time periods since their plantation.

Key words: ecological cultures, phasial fertilization, organic fertilizers, eggplants

INTRODUCTION

Eggplants have their origins in Asia (India and Birmania), but nowadays they are cultivated everywhere in the world where there are favorable weather conditions, as they are plants which love heat.

Asia remains the biggest eggplant producer, thus China produces 58% of the eggplant production from the world and India produces 27% (data from FAOSTAT 2012-2013).

The fruits are rich in vitamins, mineral salts and a series of active principles. In this way the anti oxidants present in the eggplants are concentrated mostly in the cover skin of the plant, in the category of the anthocyans. American researchers have discovered a type of an eggplant called *The Black masi*c which contains three times more anthocyans than other types of analyzed eggplants.(USDA Scientists get under eggplant's skin.VSDA Agriculture Research Service 2004).

Other researchers have swowed that if we eat eggplants that would lead to a decrease of bad cholesterol (Eudheesh S., Sandhia C., 1999). Dr. Jan Valnet(1996) assigns the eggplants a diuretic effect and he also asserts that eggplants are a hepatic and pancreatic stimulus.

Originating from warm areas, eggplants are pretentious in what heat is concerned, but they are as pretentious when it comes to light, humidity and the type of soil they are planted in.

Within the ecological culture technology, the phasial fertilization plays an important role, because an insufficient fertilization leads to a decrease of harvest and an exaggerated fertilization can lead to a physiological imbalance, making the plant sensitive to disease attacks and to pests.

The objective of the fertilization in ecological agriculture is to maintain and to increase the fertility of the soil as well as its biological activity. The system has as an aim to feed the soil so that it is able to nourish the plant. Fertilization in ecological agriculture uses a lot of organic fertilizers, starting with manure and continuing with compost, with soaked poultry litter, etc. Still, there should be no exgaeration in what the organic fertilizers are concerned as according to the regulation 834/2007 of the European Union, the maximum quantity of Nitrogen which comes from organic fertilizers and minerals should not exceed 170 kg s.a./ha/year.

In moderate quantities the organic matter has got favorable effects, as it intensifies the activity of micro organisms (Vlăduț 2001b), together with organic fertilizers, green fertilizers and soaked plants.

MATERIAL AND METHODS

The research has been performed in 2015, in a vegetable micro farm, ecologically certified, in Husasău de Tinca, a locality situated in the NV of Romania. The research has had as an aim to find the best formula of phasial fertilization in an ecological system when growing eggplants in greenhouses.

The monofactorial experience has been placed in a greenhouse (53 m Long, 10 m wide and and 4 m high) and it had 8 variants in 3 repetitions.

The experimental lots has been arranged following the method of subdivided blocks. Each variant had 15 plants. The experimental variants were the following:

$V_{1\ Mt}$ – non fertilized (only basic fertilization with manure);

V_2 – fertilized with Fertipolina in a round of 21 days since plantation;

V_3 – fertilized with Tekamin Raiz at 10 days since plantation and with Fertipolina at 20 days since the plantation;

V_4 – fertilized with Tekamin Raiz at 20 days since the plantation and with Fertipolina at 30 days since the plantation;

V_5 – fertilized with Tekamin Max at 20 days since the plantation, with Tekamin Brix at 30 days and with Nano Active at 40 days since plantation;

V_6 – fertilized with Fertipolina at 10 days and at 30 days, and with Agriful at 20 days and at 60 days since plantation;

V_7 – fertilized withTekamin Raiz at 10 days, with soaked poultry litter (produced in the farm) at 30 and at 60 days since plantation, with nano Active at 20 days, with Tekamin Brix at 40 and at 70 days since plantation;

V_8 – fertilized with Agriful at 10, at 30 and at 50 days since plantation, with Tekamin Max at 40 and at 60 days, and with Nano Active at 50 days since plantation;

The biological material was represented by the *Black Beauty* type of eggplant.

RESULTS AND DISCUSSION

Except for the fertilizations within the research plan, the other fertilizations have been performed according to the ecological technology of growing eggplants in greenhouses.

The basic fertilization has been done in autumn, with 40 t/ha decomposed manure, and until the set up of the eggplant culture, a culture of spinach has been planted.

The eggplants were planted at the beginning of April, the first harvests began in the last decade of June.The harvesting periods were over in the midLSDe of September.

The first analyzed perimeter has been represented by the influence of different schemes of fertilization upon early eggplant production. The data related to the early production of eggplants are presented in table 1.

Table 1

The early production of eggplants at Husasău de Tinca 2015

Cr. no.	Variant	Absolute production kg/m^2	Relative production %	±d	Significance
1	$V_{1\ Mt}$	1.4	100.00	0.00	-
2	V_2	1.52	108.57	+0.12	-
3	V_3	1.76	125.71	+0.36	xxx
4	V_4	1.61	115.00	+0.21	xx
5	V_5	1.57.	112.14	+0.17	x
6	V_6	1.64	117.14	+0.24	xx
7	V_7	1.79	127.85	+0.39	xxx
8	V_8	1.73	123.57	+0.33	xxx

LSD5% =0,16 LSD 1%= 0.21 LSD 0,21%=0,29

In comparison to the non fertilized witness (V_1) the highest early production increase has been obtained at the V_7 variant (127,85%), the difference towards the witness has been very significantly positively and statistically ensured. The earliness has been more obvious at variants V_3 and V_8. Phasial fertilization only with extra rootletly applications has brought an early production to variant V_5 only with 1,7 t/ha more than variant V_1, the difference towards the witness having been significantly positively and statistically ensured.

The effect of the fertilization upon the productive potential for each variant is more obviously emphasized in the analysis of the total production of eggplants. The production data, statisticlly processed for the total production of eggplants are presented in table 2.

Table 2

Total production of eggplants at Husasău de Tinca 2015

Cr. no.	Variant	Absolute production kg/m^2	Relative production %	±d	Significance
1	$V_{1\ Mt}$	4.24	100.00	0.00	-
2	V_2	4.62	108.96	+0.38	-
3	V_3	5.13	120.99	+0.89	xx
4	V_4	4.87	114.85	+0.63	x
5	V_5	5.28	124.52	+1.24	xxx
6	V_6	5.35	126.17	+1.11	xxx
7	V_7	5.64	133.01	+1.40	xxx
8	V_8	5.39	127.12	+1.15	xxx

LSD5% =0,50 LSD 1%= 0,69 LSD 0,1%=0,93

Fertilization with orgnic fertilizers associated with the stimulation of rooting (Tekamin Raiz) and minerals (Nano Active) applied to the soil and extra rootletly has proved to be the best variant (V_7) in what productivity was concerned. As a consequence, variant V_7 has registered 1,4 kg/m^2 more eggplants than variant V_1, to which no fertilization has been applied during vegetation. The difference towards the witness has been very significantly positively and statistically ensured. The differences towards the witness have been ensured the same way for the variants V_5, V_6 and V_8. Even if variant V_2 a has registered a production superior to the witness, the difference was small, and it did not overpass the P=5% limit, not being statistically ensured.

The quality of production is an element that makes the difference between a conventional product and an ecological one. It is a rule that an ecological product will always have a superior quality in comparison with a vegetable from the conventional system. We also have to mention the fact that the size of the fruit has nothing to do with its quality. If the fruit is big it

is not necessarily of a higher quality. In what our study is concerned, the quality of the harvested eggplants is presented in table 3, through a filter of 3 qualitative levels.

Table 3

The quality of the eggplant production at Husasău de Tinca 2015

Cr no.	Variant	Absolute production kg/m^2	Extra quality out of total		1st quality out of total		2nd quality out of total	
			Kg/m^2	%	Kg/m^2	%	Kg/m^2	%
1	$V_{1\ Mt}$	4.24	2.36	55.66	1.45	34.14	0.43	10.15
2	V_2	4.62	2.92	63.20	1.08	23.37	0.62	13.43
3	V_3	5.13	3.28	63.93	1.42	17.68	0.43	8.39
4	V_4	4.87	3.09	63.44	1.25	25.66	0.53	10.9
5	V_5	5.28	3.46	65.53	1.43	27.08	039	7.39
6	V_6	5.35	3.35	62.61	1.66	31.02	0.34	6.37
7	V_7	5.64	3.97	70.51	1.18	20.95	049	8.54
8	V_8	5.39	3.54	65.67	1.20	22.47	0.65	11.86

Having an assembly analysis of the quality of the eggplants, we can notice that, at all the variants, the extra quality fruits have overpassed 50%, which denotes a superior quality. The variant V_7, needs to be emphasized again, as it had over 70% extra quality fruits from the total of production. 1st quality fruits have had values between 20,95% at V_7 and 34,14 at V_1. In what the 2nd quality fruits were concerned, the values were between 6,37 at V_6 and 13,43% at V_2.

The research related to the influence of phasial fertilization upon the eggplants grown in an ecological system in greenhouses has led to a few conclusions:

1. Phasial fertilization has got a favorable effect upon the productive and qualitative potential of the eggplant culture.
2. The non fertilized variant V_1, has obtained values under the level of the fertilized variants for all the parameters analyzed.
3. Fertilization of only one product at only one application on the soil(V_2), is not justified because the quantity and quality increases are very low.
4. The fertilization with soil application or the extra rootlet fertilization do not represent the best solution (V_5 și V_6) even if better results are obtained in what productivity and quality is concerned, and not so good results are obtained in what the earliness is concerned.
5. Even if the same products are applied in different period of times, the earliness and productivity differ (V_3 și V_4). Being late with the application of fertilization leads to a delayed production as well as to a decreased one.

6. Combining organic fertilizers with mineral fertilizers and with the plant extracts applied to the soil and extra rootletly at the optimum time now that is the best variant of fertilization.

REFERENCES

1. Apahidean Al. S., Maria Apahidean, 2001, Legumicultură specială. Editura Academic Pres, Cluj-Napoca
2. Căzăceanu I., Georgescu, m., Zavoi A., 1982, Ameliorarea plantelor Horticole şi tehnică experimentală. Editura Didactică şi Pedagocigă, Bucureşti.
3. Chaux Cl., Foury Cl., 1994, Productions legumieres vol.I-III, Lavoisier, TEC/DOC, Paris.
4. Davidescu D., Velicica Davidescu, 1992, Agrochimia Horticolă. Editura Academiei, Bucureşti
5. Dumitrescu M. şi colab., 1998, Producerea legumelor. Editura Ceres, Bucureşti.
6. Horgoş A., 1999, Legumicultură specială. Editura Mirton, Timişoara.
7. Indrea D., AL.S., Apahidean, Maria Apahidean, D.N., Mănuțiu, Rodica Sima, 2009, Cultura Legumelor, Ed. Ceres, Bucureşti.
8. Indrea D., AL.S., Apahidean, 2012, Ghidul cultivatorului de legume, Ediția a II-a. Ed. Ceres, Bucureşti.
9. Lăzureanu A. Şi colab.., 1998, Agrotehnică. Editura Risoprint, Cluj –Napoca.
10. Maier I., 1969, Cultura legumelor. Editura Agro-silvică, Bucureşti.
11. Onu N., 1988, Curs de irigarea culturilor. Lito I.A.T.
12. Palageşiu I. şi colab., 2000, Entomologie agricolă şi horticolă. Editura Mirton, Timişoara.
13. Popescu Gh., 2001 Patologia plantelor horticole. Editura Eurobit, Timişoara.
14. Popescu V., 1996, Legumicultură. Vol.I. Editura Ceres, Bucureşti.
15. Popescu V., Horgoş A., 2003, Tratat de legumicultură. Editura Ceres, Bucureşti.
16. Săulescu N. A., Săulescu N.N., 1967, Câmpul de experienţe. Editura Agro-Silvică, Bucureşti.
17. Stan T. N., Stan N. T. 1999, Legumicultură, Vol.I., Editura Ion Ionescu de la Brad, Iaşi.
18. Stoleru V., 2013, Managementul sistemelor legumicole ecologice. Editura Ion Ionescu de la Brad, Iaşi.
19. Valnet Jean,1990, Se soigner par les legumes les fruits et les cereales. Librarie Maloine
20. Victor Renaud et Ch.Duduet. 1988, Le potager par les methodes naturelles.
21. Voican V., 1972, Efectul intensităţii luminii asupra creşterii şi dezvoltării asupra unor specii legumicole.
22. .Anuarul Statistic al României, 2003.
23. « FAOSTAT » [archive], sur faostat3.fao.org
24. USDA. Scientists get under eggplant's skin. USDA Agricultural Research Service 2004
25. The World of Organic Agriculture 2006, Statistics and Emerging Trends - 8th revised edition,Ed. IFOAM,Bonn, 2006 (www.ifoam.org).
26. European Commission Report (G2 EW – JK D, 2005, Organic farming in the European Union – Facts and Figures‖, Bruxelles, 3th November 2005
27. http://europa.eu.int/comm/environment/gpp/
28. www.cittadelbio.it
29. xxx REGULAMENT (CE) NR. 834/2007 AL CONSILIULUI din 28 iunie 2007 privind producţia ecologică şi etichetarea produselor ecologice, precum şi de abrogare a Regulamentului (CEE) nr. 2092/91;
30. xxx REGULAMENT (CE) NR. 889/2008 AL COMISIEI din 5 septembrie 2008 de stabilire a normelor de aplicare a Regulamentului (CE) nr. 834/2007 al Consiliului în ceea ce priveşte producţia ecologică, etichetarea şi controlul
31. xxx http:// www.madr.ro