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RESEARCH CONCERNING EFFECTS OF PERLITE SUBSTRATE ON TOMATO IN SOILLESS CULTURE

Elena Maria DRĂGHICI, Maria PELE, Elena DOBRIN

University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Marasti Blvd, District 1, 011464, Bucharest, Romania

Corresponding author email: elena.draghici@horticultura-bucuresti.ro

Abstract

In Romania, soilless culture method in perlite substrate for tomato crop is still in early stages. Few farmers practice the culture on perlite substrate. Soilless cultures have many advantages such as increased yield, health and uniform product, conservation of water and land, better protects an efficient control of environmental pollution and reduce of workers for cultivation. The aim of this study was effects of perlite substrate on tomato yield and fruit quality in soilless cultivation. This study has done in the Hortiviticultural Systems Bioengineering Department, University of Agricultural Sciences and Veterinary Medicine-Bucharest. Tomato culture was founded on mattresses filled with perlite. Experimental variants were the type of size particle of perlite from mattress. The mattresses had provided a volume of 10 l perlite / plant. We used three types of grain of perlite of 2 mm, 4 mm and 5 mm. The best results were obtained when using perlite as substrate grain 4 mm.

Key words: *perlite substrate, tomatoes, size grain.*

INTRODUCTION

Supply the market with fresh vegetables is a priority with economic and social implication. Therefore, the researchers are permanently constrained to finding new modern growing technology, perfumed that to assure a high production (Abrar, 2011).

The most frequently unconventional systems are the systems of vegetables growing on Grodan and NFT systems.

Extending these culture systems have some drawbacks such as the rock wool culture system requires enormous quantities of this material, material subsequently back into circulation very difficult and NFT system involves rearranging production facilities by installing gutters, an operation that is very costly financially.

In view of the above, it is necessary to develop technologies that are not expensive, can be made with cheap materials and handy, but at the same time ensuring high productivity both quantitatively and qualitatively.

The culture of perlite substrate has two major advantages: it is very accessible from economically within the global trend as organic (Draghici et al., 2012).

In the global horticultural production, vegetable crops 'without soil' had begun already gain a leading position. These unconventional systems of culture are great interest both for researchers and for those who practice in order to achieve products for human consumption.

In Romania, expansion of these systems raises serious technical and economic issues, so it is necessary to establish culture technologies applicable, using local materials and equipment imported or to be accessible to a larger number of users (Atanasiu N., 2009).

Extending this systems create some problems referring to polluting because the Grodan is a substrate that is difficult to recycled.

Purpose of research in this study was to identify the best composition based on perlite substrate and recommend it to obtain early and total yields, quality and price of low cost.

Expanded perlite is a substrate of culture that completely replaces soil.

MATERIALS AND METHODS

The experiment was carried out in the vegetable sector in Bucharest, Faculty of Horticulture.

The biological material used was the hybrid tomato Gaheris.

Experience consisted of the following experiments presented in Table 1.

Table 1. Experimental variants

Variants	Substrate types	Growing
V1	Control	Growing on soil
V2	Perlite 2mm	Growing on mattresses
V3	50% Perlite of 2mm and 50% peat	Growing on mattresses
V4	Perlite 4mm	Growing on mattresses
V5	Perlite 4mm+peat	Growing on mattresses
V6	Perlite 5mm	Growing on mattresses
V7	Perlite 5mm+peat	Growing on mattresses

Culture was established in unheated solarium. Of each variant we use four mattresses of 1 m long for each where we had planted each three plants. In total, 24 mattresses were installed.
The distance between the mattresses was 90 cm and 35 cm between plants. Therefore, for each plant we had assured 10 l perlite substrate. Mattresses had contained 30 l of substrate. Plant density was 31,746 plants per ha.
Hydroponics mattresses were made of biodegradable polyethylene, triple laminated, composed of two layers, colored black inside and white outside. Mattresses have a length of 1 m and a width of 20 cm. The experiments were realized on some mattresses prototype created by SC Procema SRL, Romania.
The fertilizing recipe was modified with phenophase. In the first phenophase, immediate period after planting, for each plant we gave amount 50 ml of solution per *fertigation*-for 2 weeks.
Daily we had administrated a number of six watering.
I increased the amount of solution per plant as the plants increased in height, so had administrated between 100 ml and 200 ml depending on temperature and light.
Measurements and determinations made.
During the growing season were conducted observations and determinations so:
- increase in plant height;
- number of leaves;
- number of leaves until the first inflorescence;
- number of leaves between inflorescences;
- average distance between inflorescences;
- determine the number of inflorescences and flowers in blossom;
- percent of binding of fruit;
- early production;
- the quantity of fruit harvested per plant;
- the average fruit per harvest;
- the total production;

Fruit production was determined by weighing.
For each determination was made statistical analysis

RESULTS AND DISCUSSIONS

From the figure 1 we can see in dynamic the growing of plants on the experimental variants.

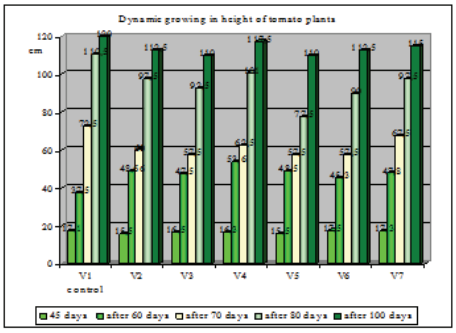

Figure 1. Dynamic growing in height of tomato plants

Total number of the flowers and fruits formed on inflorescences are presented in table 2.

Table 2. Total number of the flowers and fruits formed on inflorescences

Variants		Inflorescences					
		1st	2nd	3rd	4th	5th	6th
V1	No. Flowers	9	9	7	7	9	9
	No. fruits	5	5	4	4	3	3
V2	No. Flowers	9	9	9	9	11	14
	No. fruits	5	06.05	04.05	02.05	2	7
V3	No. Flowers	9	9	9	08.05	7	9
	No. fruits	6	3	5	05.05	02.05	4
V4	No. Flowers	8	9	9	7	7	7
	No. fruits	8	4	6	3	7	5
V5	No. Flowers	7	9	7	9	5	5
	No. fruits	7	0	4	3	4	1
V6	No. Flowers	11	7	5	6	6	5
	No. fruits	6	7	4	2	3	3
V7	No. Flowers	7	9	7	7	7	10
	No. fruits	5	6	4	1	0	5

In the table no 3 is noted that the highest percentage of binding occurs in variant no 4

with 70.21% as compared to Control, Variant no 1, were the percentage of binding was 48%.
A large percentage of fruit we had obtained at the V6 about 62.5% and 50.49% at the V3.
The variants 2, 5 and 7 we had registered a percentage below 50%.

Table 3. Total number of flower and fruits formatted on plant and percentage of binding

Variants	Total flowers formatted on plant	Total fruits formatted on plant	Percentage of binding
	no.	no.	%
V1 Control	50.0	24.0	48
V2 Perlit 2mm	61.0	27.mai	45.08
V3 Perlit 2mm+peat	51.5	26.0	50.49
V4 Perlit 4mm	47.0	33.0	70.21
V5 Perlit 4mm+peat	42.0	19.0	45.24
V6 Perlit 5mm	40.0	25.0	62.5
V7 Perlit 5mm+peat	47.0	21.0	44.68
Average	48.36	25.ian	51.85

At the first harvesting, are not existing differences between variants except the V2 where I remarked a positive significance statistic point and view (Table 4).

Table 4. Fruits mass at the first harvest

Variants	Fruits mass	Differences		Significance
	kg	Kg	%	
V1	0.40	0.00	100.0	Mt
V2	ian.17	0.78	295.09	*
V3	0.76	0.37	191.82	N
V4	0.47	0.07	118.24	N
V5	0.38	-0.02	95.97	N
V6	0.67	0.27	167.42	N
V7	0.86	0.46	215.60	N
Average	0.67	0.27	169.16	N

DL5%=0.520 DL1%=0.780 DL01%=1.250

At the first harvest, were collected from V1 four fruits with 100g in average fruit. Production obtained from this variant had the lowest referring to average mass (Table 5).
Most fruits were harvested from V2. Were harvested an average of 10 fruits per plant, with an average mass of 117 g on fruit. The largest fruits were harvested at 3 and 5 variants with 127 g average fruit. Of all the variants at the Variant 2 we harvested 10 fruits with weight of fruit of 117 g and at the V5 we harvested only 3 fruits per plant with an average of 127 g fruit.

Table 5. The number of fruit and average mass of fruit at the first harvesting

Variants	Number of fruits obtained on plant no.	Products on plants g/plant	Average mass of fruits g
V1	4	400.0	100.00
V2	10	1173.0	117.30
V3	6	762.5	127.08
V4	4	470.0	117.50
V5	3	381.5	127.17
V6	6	665.5	110.92
V7	7	857.0	122.43

In the table 6 are presented production, number of fruits and the average mass of fruit obtained on plant at the second and last harvested. We can remark that at the second harvest, the highest production had obtained at the V2 (1320.4 g/plant) and smallest production at the V6 (920.0 g/plant). In average the mass of fruit had varied between 117.5 g/fruit at V4 and 125.0 g/fruit at the V3 (the second harvest). At the last harvest were recorded 1322.40 g/plant at the control (V1). In addition, we can observe that at the last harvest the fruit mass was between 101.5 g/fruit at the V2 and 120.0 g/fruit at the V7.

Table 6. The production obtained at the second and the last harvested

Variants	The second harvest			Last harvest		
	Products on plants	No fruits	Average mass on fruit	Products on plants	No. fruits	Average mass on fruit
	g/plant	No.	g	g/plant	No.	g
V1	942.4	8	117.8	1322.4	12	110.2
V2	1320.0	11	120.0	659.75	06.mai	101.5
V3	1250.0	10	125.0	1150.0	10	115.0
V4	1645.0	14	117.5	1545.0	15	103.0
V5	1089.9	9	121.1	821.10	7	117.3
V6	920.0	8	115.0	1265.0	11	115.0
V7	964.0	8	120.5	720.00	6	120.0

The production obtained during a month was at 3.66 kg on the plant at V4 and 2.292 kg on the plant at V5 (Table 7).
The highest percentage was recorded at V7 and the lowest at V3, compared to the control, table 7.

Table 7. Total production on plant

Variants	Total on plant	Percent to control
	g/plant	%
V1	2662.80	100.00
V2	3152.75	118.40
V3	3162.50	118.77
V4	3660.00	137.45
V5	2292.50	86.09
V6	2850.50	107.05
V7	2541.00	95.43

CONCLUSIONS

On the plant were six inflorescences formatted in three months after planting on perlite substrate.

The number of fruit on inflorescences varied between 3 at the fifth and sixth cluster and five at the first and second clusters (V1 control).

The best results were obtained when using perlite as substrate grain 4 mm of 3.66 kg on the plant.

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