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STUDY ON THE INFLUENCE OF SUBSTRATE CULTURE ON THE PRODUCTION OF CUCUMBERS IN UNCONVENTIONAL SYSTEM

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Abstract

Cucumbers are one of the basic crops in greenhouse being grown on large areas in both the cycle and cycle II of culture. It is a very demanding species to the conditions of culture, but if you apply an adequate technology can bring obtained yields with important benefits. In greenhouse is practiced both the culture on soil and soilless culture. The advantages of cultivation on soilless consist of an effective monitoring of medium of culture, in particular irrigation and nutrition. Culture substrates are selected such that they do not interact with the nutritional solution. Perlite is a substrate inexpensive, reusable and ensuring earliness and production increase. The present study was conducted in greenhouses at Hortinvest Research Centre of University of Veterinary Medicine from Bucharest. Culture of cucumber was established in the first cycle and used Pyralis hybrid, specific for greenhouse crop. We used three experimental variants of mattresses filled with grain of 2, 4 and 5 mm diameter. The best solution to a grain size of perlite was the variant with 4 mm diameter, ensuring the most satisfying results for early and total production. The aim of the study was to identify the best solution culture substrate games and recommend the use of crops without soil growers.

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

INTRODUCTION

In Romania, cucumbers culture occupies an important place. The cucumbers are cultivated in different growing systems, as: greenhouse, solar, polytunnels or open field, so the production is covered market throughout the year. Growing cucumbers on nutrient substrate is practiced only on farms that have appropriate technology as this type involves careful coordination of all environmental factors, in particular the fertigation.

FAO Yearbook 2012 states that in 2004-2011, the production and the cultivated areas with cucumbers had had on all continents a significant increment. Increased production was based on improving production efficiency as a result of technical progress in this area, diversification assortment of varieties grown, expanding culture of hybrids with high yield potential, reduce losses caused by pests and diseases through integrated control of their sector developer of greenhouses and solariums by increasing the surface and generalization of modern technologies, concentration of production in favourable areas.

In recent years, many studies have been made on soilless cucumber production in greenhouses in Turkey (Özgür, 1991; Canatar, 1997; Saracoglu, 1997; Öztan, 2002; Kaptan, 2006; Gül et al., 2006; Gül et al., 2007. cited by Engindeniz and Gül, 2009). Though, there is still need for study, especially on economics of soilless cucumber production at farmers' level.

Therefore, the researchers are permanently constrained to finding new modern growing technology, perfumed that to assure a high production.

The most frequently unconventional system is the system of cucumber growing on substrate of Grodan (Petre et al., 2014).

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.
Results made of Peyvast et al., 2010, showed that substrates had a significant effect on the plant growth, total fruit yield, marketable fruits, fruit weight and number of fruits per m^2.
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.
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 high yields, quality and price of low cost. Expanded perlite is a substrate of culture that completely replaces soil.

MATERIALS AND METHODS

The study was conducted within the greenhouses of Hortinvest Research Center – University of Agronomic Sciences and Veterinary Medicine Bucharest, between February and June 2014. The biological material used was the cucumber hybrid Pyralis.
The experiments consisted in cultivation on the Perlite substrates presented in Table 1 and monitoring various growth factors.
The culture was established in greenhouse heated to 10 February 2014. The planting seedlings had 32 days.

Table 1. Experimental variants

Variants	Substrate types	Growing
V1	Perlite 2mm	Growing on mattresses
V2	Perlite 4mm	Growing on mattresses
V3	Perlite 5mm	Growing on mattresses

Of each variant we use twenty four mattresses of 1 m long for each where we had planted each three plants. For each plant has been assured 10 l perlite substrate. Mattresses had contained 30 l of substrate. Plant density was 18,500 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 fertilizing recipe was modified according to phenophase.
In the first phenophase, immediate period after planting, for each plant were provided an amount of 50 ml of solution per fertigation - for 2 weeks.
Daily it has been administrated a number of six watering.
The amount of solution per plant as the plants increased in height was increased, so had administrated between 150 and 200 ml depending on temperature and light.
During the growing season were conducted observations and determinations so:
- Plant growth in height;
- Early production;
- The quantity of fruit harvested per plant;
- The average fruit per harvest;
- The total production;

Fruit production was determined by weighing. Each assay was performed at least 3 times.
For each determination was made statistical analysis

RESULTS AND DISCUSSIONS

During the period of culture the greenhouse temperatures were recorded and the averages are shown in Figure 1.

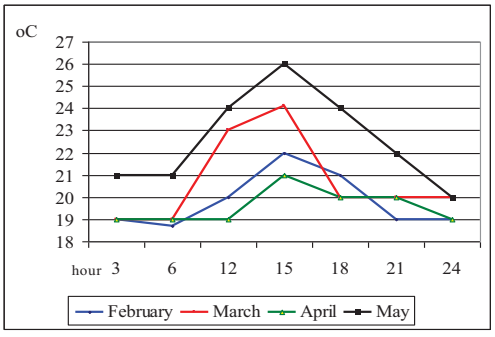

Fig. 1. Average temperature recorded in greenhouse

The plants had grown in height between 163.8 cm and 171.2 cm V1 to V3 (table 2).

Table 2. Dynamic growing in height of cucumber plants

Variant	UM	Number days after planting			
		10	20	30	40
V1	cm	26.8	127.5	147.5	163.8
V2	cm	24.5	117.1	140.7	165,0
V3	cm	24.3	122.8	143.2	171.2

From the statistical point of view, we could notice insignificant differences in plant height growth after ten days of planting (table 3).

In March, the largest quantity was harvested from V2 (1804 kg / plant). The lowest production was obtained at V3 (1,155kg / plant).

Table 3. Summary of results of differences in height after 10 days of planting

Variant	Hight	Difefference	Significance
	(cm)	(cm)	(%)
V(0) Average	25.20	0.00	100.00 Mt
V(1)	26.80	1.60	106.35 N
V(2)	24.50	-0.70	97.22 N
V(3)	24.30	-0.90	96.43 N
DL5% =	1.750	DL5% in % =	6.9444
DL1% =	3.800	DL1% in % =	15.0794
DL01% =	12.890	DL01% in %=	51.1508

Also, we could notice, insignificant differences regarding plant height growth of point of view statistically, table 4.

Table 4. Summary of results of differences in height after 40 days of planting

Variant	Hight	Difference	Significance
	cm)	(cm)	(%)
V(0) Average	166.67	0.00	100.00 Mt
V(1)	163.80	-2.87	98.28 N
V(2)	165.00	-1.67	99.00 N
V(3)	171.20	4.53	102.72 N
DL5% =	7.010	DL5% in % =	4.2060
DL1% =	15.220	DL1% in % =	9.1320
DL01% =	51.550	DL01% in %=	30.9300

In April, we recorded the highest production of 7.811kg / plant at V2 followed by V1 with 7.166 kg / plant and V3 with a production of 6.431 kg / plant.

In May it were harvested from V2 the quantity of 5.249 kg / plant, and from V1 only 4.914 kg / plant (figure 2).

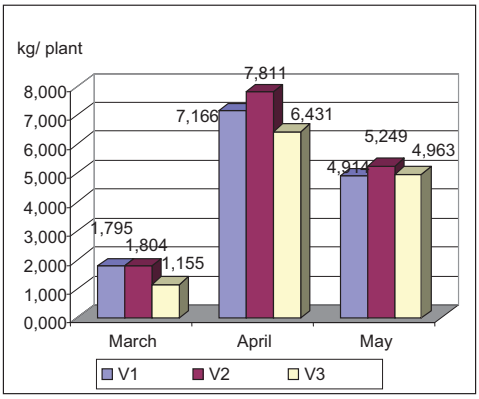

Figure 2. The production obtained per plant

The biggest total production per plant was obtained at V2 (14.864 kg/plant), followed by V1 (13.875 kg/plant). The lowest production I got it from V3 of 12.550 kg / plant (figure 3).

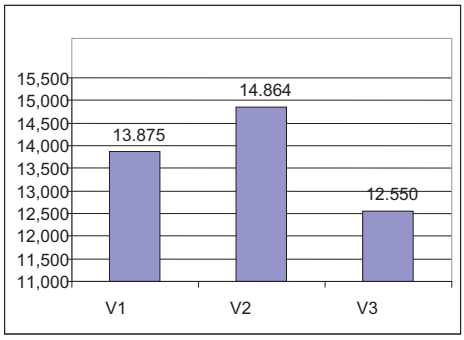

Figure 3. Total yield obtained per plant -kg/plant

CONCLUSIONS

Results show that both in terms of total and per plant production, the best culture substrate is Perlite 3. Reduced particle size of Perlite 1 cause a reduced aeration to roots level and therefore a slow development respectively a lower production. In the case of Perlite 3, the larger size of grains leads to a more rapid drain of fertilizer solutions and therefore a lower consumption of nutrients by plants.

The earliest production was found in the cultures developed on Perlite 3, too.

It has to be emphasized that a problem in greenhouse culture is the temperature variations, because the outside temperature has a real influence on inside temperature even though it is used a good system to keep the temperature at the same value. So, evaluation of temperature variations shows a clear increase in temperature in the greenhouse in May. The explanation is in the fact that the warm weather outside cause an increase in the temperature inside the greenhouse. Therefore it requires a temperature control of greenhouse temperature through the use of appropriate ventilation systems. Of cause, this action will lead to a relatively high consumption of electricity.
Thus, as a general conclusion, the best substrate of those tested for growth of cucumbers in greenhouses is Perlite 3.

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