

**RESEARCH CONCERNING GREENHOUSE TOMATOES GROWN ON
ORGANIC SUBSTRATUM IN ROMANIA**
**CERCETARI PRIVIND CULTURA TOMATELOR IN SERE PE SUBSTRAT
ORGANIC IN ROMÂNIA**

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REZUMAT

În România, metodele de cultură a legumelor de seră „fără sol”, se găsesc încă în fază de experimentare.

Cercetările colectivului de la disciplina de Legumicultură din cadrul USAMV Cluj-Napoca s-au direcționat spre cultura tomatelor pe substrat de turbă, în pungi de polietilenă și aprovizionate cu îngrășăminte solide și soluții nutritive.

Rezultatele cele mai bune s-au obținut când s-a utilizat ca substrat un amestec format din turbă 80%+pământ de țelină și mranită 20% și s-a asigurat un volum de cel puțin 8 l amestec/plantă.

CUVINTE CHEIE: tomate, seră, substrat organic, România

ABSTRACT

In Romania, soilless culture methods for greenhouse vegetables are still in experimental stage. The research of vegetable growing department, team from USAMV Cluj-Napoca, followed tomatoes culture on polyethylene peat bags, supplied with solid nutrients and nutritive solutions.

The best results were obtained when a mixture of peat 80%+long duration follow soil and well-decomposed manure 20% was used and a volume of at least 8 l substrat/plant was ensured.

KEY WORDS: tomatoes, greenhouse, organic substrat, Romania

DETAILED ABSTRACT

In this paper are presented the results obtained between years 1999-2000, at greenhouse tomatoes grown on peat substrat and other materials.

Marpha F1 hybrid was used in this experience. It was a bi-factorial experience with the following facts:

- A – substrat composition : a1 – new mixture; a2– old mixture; a3– new mixture 50% + old mixture 50%; a4– new mixture 50 + perlite 50%;
- B – substrat volume for a plant: b1 – 6 l; b2– 8 l; b3– 12 l;

The culture was done in polyethylene bags with different volume: 6,8 and respectively 12 l of substrat/ plant.

Early yield, considered to be recorded till 31st May, was over 6 kg/m² for all variants (table 1). It was between 7,24-8,75 kg/m² for variants cultivated on organic substrat and between 7,81-8,61 kg/m² when new mixture was mixed in a 50% proportion with perlite.

Total yield of tomatoes, obtained between April and July, was between 12,44-13,93 kg/m² for variants with small volume of substrat (6 l/plant), between 15,28-16,30 kg/m² for variants with medium volume of substrat (8 l/plant) and between 14,64-16,25 kg/ m² at those with a volume of 12 l substrat/plant (table 2).

Commercial quality of tomatoes was much influenced by substrat composition.

INTRODUCTION

In Romania, the total surface area of greenhouses was 1800 ha in 1990, of which 1000 ha remained as warmed greenhouses in 2001. Most of this surface is used in classic culture systems, with soil planting, in two culture cycles: winter – summer and summer-autumn. Because of this, yields are relatively small, late and they are obtained with high expenses due to both high costs of energy and high costs of materials as soils steam disinfection, which appreciably diminish the economic efficiency of greenhouse cultures. In other countries soilless culture systems on rockwool, NFT and organic substrats, with a rigorous control of water supply and nutrition, were developed [3,6].

In Romania, soilless culture methods of greenhouse vegetables are still in experimental stage [1,3,4,5].

Since both hydroponic culture system and synthetic substrat culture require special equipment, the research of the vegetable growing department team, from USAMV Cluj-Napoca, focused on tomatoes peat culture in polyethylene bags with solid and soluble nutrients supply.

The main advantages of bags culture are a high decrease of substrat volume (about 4-5%), of water requirement (about 8-10%) and nutrients used (about 3-8%) given the soil culture requirements [7]. Also, at soilless culture, steam soil disinfection, which is very expensive, is eliminated. Besides, a better nutrition using nutritive solutions and electronic means can be ensured. The research of the vegetable growing team was done to establish the substrat composition and volume recommended for a plant, as well as the fertilisation way; also the possibility of partial peat replacement with other materials (perlite) and the possibility of peat re-use were studied.

In this paper the results obtained between years 1999-2000 are presented, at greenhouse tomatoes grown on peat substrat and other materials.

MATERIAL AND METHOD

Marpha F1 hybrid was used in this experience. It was a bi-factorial experience with the following facts:

- A – substrat composition : a1 – new mixture; a2– old mixture; a3– new mixture 50% + old

mixture 50%; a4– new mixture 50 + perlite 50%;

- B – volume of substrat for a plant: b1 – 6 l; b2– 8 l; b3– 12 l;

The new mixture was made of brown peat (80%) and long duration fallow soil + well decomposed manure (20%), fertilised with macro and micronutrients.

The old mixture had the same composition but it had been used a year before for tomatoes culture, too. Before re-use it was steam disinfected.

The culture was done in polyethylene bags with different volume: 6,8 and respectively 12 l of substrat/ plant. Transplant planting in experimental culture was done in the second part of January. Usual technology for the I-st cycle tomatoes culture was applied and additional fertilisation with N, P, K and micronutrients were applied. An irrigation pipe was laid along the middle of the double rows and small-bore tubing was moved into position to water each plant.

Observations were made about growth and plant fructification, quantity and quality of yield.

RESULTS

Growth and plant fructification were influenced both by composition and volume of substrat used. Thus the medium height of plants recorded was found to be between 249,2-292,5 cm.

Medium number of leaves was found to be between 42,0-50,4 and inflorescences number between 10,8-12,8. Plants vigour, manifested through plant growth and number of leaves, increased for variants, with 8 and 12 l of substrat/ plant being the best values for new mixture and new mixture + perlite, respectively. Thus, at variant with new mixture, plants height was about 285,0 cm for an 8 l volume of substrat/plant and 292,5 cm for a 12 l volume of substrat/plant, and 249,6 cm when a volume of 6 l substrat/plant was applied.

When new mixture + perlite was used as substrat, height of plants varied between 271,7 and 280,8 cm depending on volume of substrat used for each plant.

Fruit harvesting started in the first ten days of April. Crops dynamics was improved for the variants cultivated on new mixture or new mixture + perlite.

Early yield, considered to be recorded till 31st May, was over 6 kg/m² for all variants (table 1). It was included between 7,24-8,75 kg/m² for variants cultivated on organic substrat and between 7,81-8,61

kg/m² when new mixture was mixed in a 50% proportion with perlite. Old mixture utilisation determines a decrease of early yield especially for variants with a volume of 6 l substrat/plant.

Table 1: The influence of substrat composition and volume on early yield of tomatoes

crt no	Variant		Early yield		Difference Kg/m ²	Significance
	Substrat composition	Volume	Kg/m ²	%		
1	New mixture	6 l	7,24	100,0	-	-
2	New mixture	8 l	8,46	116,8	1,22	**
3	New mixture	12 l	8,75	120,9	1,51	***
4	Old mixture	6 l	6,39	88,3	-0,85	o
5	Old mixture	8 l	6,97	96,3	-0,27	-
6	Old mixture	12 l	7,12	98,3	-0,12	-
7	New + old mixture	6 l	7,50	103,6	0,26	-
8	New + old mixture	8 l	7,90	109,1	0,66	-
9	New + old mixture	12 l	7,02	96,9	-0,22	-
10	New mixture +perlite	6 l	7,81	107,9	0,57	-
11	New mixture +perlite	8 l	8,31	114,8	1,07	**
12	New mixture +perlite	12 l	8,61	118,9	1,37	***

DL (P 5%): 0,70; DL (P 1%): 0,96; DL (P 0,1%): 1,32

Total yield of tomatoes, obtained between April and July, was measured between 12,44-13,93 kg/m² for variants with small volume of substrat (6 l/plant), between 15,28-16,30 kg/m² for variants with medium

volume of substrat (8 l/plant) and between 14,64-16,25 kg/ m² for those with 12 l volume of substrat/plant (table 2).

Table 2: The influence of substrat composition and volume on total yield of tomatoes

crt no	Variant		Total yield		Difference Kg/m ²	Significance
	Substrat composition	Volume	Kg/m ²	%		
1	New mixture	6 l	12,56	100,0	-	-
2	New mixture	8 l	15,73	125,2	3,17	***
3	New mixture	12 l	15,49	123,3	2,93	***
4	Old mixture	6 l	12,44	99,0	-0,12	-
5	Old mixture	8 l	15,61	124,3	3,05	***
6	Old mixture	12 l	14,64	116,5	2,08	**
7	New + old mixture	6 l	13,93	110,9	1,37	*
8	New + old mixture	8 l	15,28	121,6	2,72	***
9	New + old mixture	12 l	14,75	117,4	2,19	**
10	New mixture +perlite	6 l	13,82	110,0	1,26	-
11	New mixture +perlite	8 l	16,30	129,8	3,74	***
12	New mixture +perlite	12 l	16,25	129,4	3,69	***

DL (P 5%): 1,28; DL (P 1%): 1,77; DL (P 0,1%): 2,43

The best yields (over 16 kg/m²) were obtained when new mixture 50%+perlite 50% was used and the volume of substrat was about 8 l and 12 l/plant, respectively. Regardless of substrat type used, total

yield of tomatoes was higher when 8 l of substrat/plant was used.

Commercial quality of tomatoes was much influenced by substrat composition. An increase of

substrat volume/plant ensured a slight growth of high quality yield. The proportion of high quality fruit (extra+I-st quality) was found to be between 93,79 and 96,86 being higher for variants with 8 and 12 l volume of substrat/plant.

CONCLUSIONS

1. Increase of organic substrat volume from 6 to 12 l/plant had favourable effects and determines an improvement of yield and yield indicators. However medium volume of substrat (8 l/plant) ensured the best efficiency both for early yield and for total yield.

2. Utilization of old substrat, steam disinfected, over fertilized, as well as of perlite mixed with new substrat can represent an efficient alternative for increased volume of substrat/plant when cost decrease is a serious consideration.

3. Commercial quality of tomatoes fruit, recorded for all types of substrats used, was clearly superior for a medium volume of substrat/plant [8 l] to a small volume of substrat/plant [6 l] applied and with insignificant differences when the maximum volume (12/plant) was applied.

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