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RESEARCH AND RESULTS ON THE IMPLEMENTATION OF MODERN TECHNOLOGICAL ELEMENTS IN TOMATOES GROWN IN OLD INDIVIDUAL GREENHOUSES

Mileva CHIRICĂ[1], Gheorghe CÂMPEANU[1], Felicia STAN[1], Nicolae ATANASIU[1], Gabriela NEAȚĂ[1]

[1]University of Agronomical Sciences and Veterinary Medicine Bucharest, Horticultural Faculty, Mărăști, 59, Sect. 1, Bucharest, Romania

Corresponding author email: neatag@yahoo.com

Abstract

Efficient use of old greenhouses for growing vegetables in the current period is only possible by applying modern technology that unconventional fluid and mineral nutrition is achieved by fertirigation with nutrient solutions of growing media. For making tomato crops for fresh consumption, have carried out the reconfiguration of the interior heat greenhouses by installing the old parapets, reposition the heating registers and levelers, totally unsuitable for use as a substrate rooting for tomato plants. As the rooting medium was used peat bags installed in opaque foil UV additive, ensuring a rooting volume of 12L, which were planted two seedlings, resulting in a density of 3.12 plants/ m^2. Nutritive solution was prepared and given with automatic installation, connected to the installation of fertigation mounted in greenhouse. There were used soluble compound fertilizers produced by Scott's and Yara. Tomato crops produced with this technology, according to a specific cultural calendar cycle extended tunnels, there was a production of over 15 kg/m^2, the laboratory results have confirmed a low level of biochemical components within the limits prescribed by legislation for the production of tomatoes in protected culture.

Keywords: *biochemical analysis, nutrient solution, soluble fertilizer, tomato*

INTRODUCTION

Use as a production base, for vegetable old greenhouses, is a priority for farmers in their possession. Conventional soil cultivation technologies are expensive and polluting less productive land and vegetable species with which they work [8, 9]. Now is an unconventional alternative crop on organic or inorganic substrates, the use of which requires the use of a material base and specific technologies, whose application does not raise special problems [1, 2, 5, 6, 7].

This paper shows how to work for the redevelopment of old greenhouses, in order to achieve the necessary conditions for implementation of the tomato crop on peat, with fluid and mineral nutrition fertilization provided by closed circuit.

Solutions applied based on the results obtained in previous years the experimental program conducted to achieve a doctoral thesis.

MATERIAL AND METHOD

The material consists of bodies rearranged individual greenhouses with width of 6.4 m, built over 60 years ago.

These greenhouses are equipped with internal parapets of brick and concrete, were originally intended to produce flowers.

The use that was not economic in recent years, establishing redevelopment objective and necessary equipment for unconventional vegetable crops.

Major changes and features made are:

- For redevelopment inside the greenhouse:

- Balustrade interior demolition, the floor of the greenhouse was maintained former technological paths and surfaces of which, covered with brick and leveled;
- Repositioning the heating-pipes;
- Redeploying existing ventilation windows on the sidewalls and roof pitches;
- Installation of a network of supply lines for solution dropper nutritional bags of peat culture substrate;

- To prepare and distribute nutrient solution:

- Purchase and installation of an automatic cooking stations for nutritive distribution solution, the concentration parameters (EC) and reaction (pH), the scheduled quantities;
- Connection Station to a permanent water source and pressure mains;
- Connecting the station to prepare the solution to the distribution of greenhouses

Provide UV treated polyethylene bags where is introduced culture substrate

• To achieve experimental variants, tomato cultivars [10] used were:

- Katerina F1 - Dutch origin;
- Amanda F1 - created in Israel. Key Elements specific technology used in the experiment were:
- Cycle culture system with delayed planting, but in early February and end of harvesting in late June;
- Seedlings produced in large pots with sides 10 cm in peat substrate Biolan were planted at the age of 65 days;
- Scheme of planting seedlings equidistant away from 160 cm. On these occasions were placed opaque polyethylene bags with drainage holes applied to 5-6 cm above the base of support.

The rooting substrate bags of peat 12 L were planted two plants. Distance between centers of two bags per row was 40 cm.

From planting scheme - 160/40cm bag x 2 plants resulting density of 1.56 bags/m^2 or 3.12 plants/m^2. Nutrient solution is distributed with one hose with flow 2L/hour spaghetti type for each plant. Nutrient solution distributed plants with nutrients was within the following limits: - Total - 180-225 ppm nitrogen, potassium: 225-300 ppm, calcium: 145-185 ppm, magnesium: 38-42 ppm, phosphorus: 40-50 ppm, SO_4 - 40-60 ppm, micronutrients: iron, manganese, boron, copper, zinc, molybdenum.

As sources of nutrients [11] were used Scott´s soluble compound fertilizers and the addition of calcium nitrate and magnesium sulphate. Electroconductivity was maintained at values of 2.6 mS/cm^2 - 3mS/cm^2 and the pH was 6.4. Consumption of nutrient solution was between 50-60 mL/plant/day immediately after planting and from 1.6 to 1.7 L/plant/day in June on plants located in eight-9 blossoms.

To avoid increasing the concentration at the bottom of the bag, was determined periodically electroconductivity, intervening by increasing the flow of nutrient solution or irrigation water for a short period, in this way was reduce the nutrient solution. To ensure complete pollination in greenhouses with mosquito nets to windows of ventilation were used bumble. The felt they pollination by increasing the average weight of fruit for the first five blossoms. Flowers of the last three blossoms were open pollinated, with negative consequences on the average weight and fruit number. Plants, palisades the trellis height of 2.20 m, total child, have been cropped to 8 flowers. Plants were the only problems created by repeated and virulent attacks by white midge (*Trialeurodes vaporariorum*) on the same site due to the existence of greenhouses with collections of perennial flower species. The experience was made observations and measurements from which results were obtained, of which most important are listed below.

RESULTS AND DISCUSSIONS

Tomato culture presented was characterized by vegetative growth and balance alerts, developing a very robust unit leaf. The substrate used - Biolan coarse peat – [3, 4] the optimum conditions of moisture and aeration for plant roots in culture. Plant physiological status and allowed normal growth and enjoyment to the installation of high temperatures, above 35-38ºC at the beginning of June, which could not be controlled by the particular construction of greenhouses.

As I have shown you, temperatures caused excessive loss bumble, with direct consequences on vegetative fructification on flowers 6.7 to 8.

Results on yields achieved are presented in Table 1.

Fruit quality, determined by chemical and biochemical analysis is presented in Table 2.

Nitrate compounds that influence consumer acceptance of tomatoes in both cultivars accumulated in high amounts indicating that fertilization culture was better ensuring achievement of genetic potential of these tomatoes.

Table 1. Total production and its components. Tomatoes (cycle I) the organic substrate (peat)

Specification	Katerina F1	Amanda F1
Average number of fruits per inflorescences 1-5	5.2	5.4
Average number of fruits per inflorescences 6-8	4.1	4.6
Average weight of fruit on inflorescences 1-5, g	136	144
Average weight of fruit on inflorescences 6-8, g	93	96
Production per plant on flowers 1-5, kg	3.540	3.890
Production per plant on flowers 6-8, kg	1.144	1.325
Total production per plant, kg	4.684	5.215
Production kg/m^2	14.614	16.270

Table 2. Biochemical and agrochemical components of vegetables

Specification	Katerina F1	Amanda F1
Nitrate, ppm	215.3	225.7
Phosphates, ppm	287.3	245.2
Potassium, ppm	2150	1980
Soluble carbohydrates,%	2.35	3.10
Acidity,%	0.43	0.41
Vitamin C, mg/100 g fresh tomato	15.45	14.38

Comparing the contents accumulated maximum permitted level in our country that this compound 300 ppm N-NO3 can be said to meet quality tomatoes for consumption. Phosphates also accumulated in large quantities from 287.3 ppm Katerina F1 to 245.2 ppm in Amanda F1 indicating that fertilization culture was observed and is good quality tomatoes.

If potassium can say the same thing, namely its accumulation in tomato provides a good quality transport and good firmness of fruit. Biochemical characteristics are also obtained in normal tomatoes taste so good.

CONCLUSIONS

Converting old greenhouses to go to their cultivation of vegetables is possible using equipment and materials that can be purchased and our country.

The production made the 14.614 kg/m^2/year at Katerina F1 and 16.270 kg/m^2/year to Amanda F1 can be considered as very good for growing tomatoes in greenhouses for over 60 years old. Tomato fruit quality judged by the nutrient content is good quality can be compared with tomato fruit obtained in normal culture. Nitrate content is good and falls under CMA of the Ministry of Health Law No. 1 from 2002 year, value presented of 300 ppm.

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