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PRODUCTION OF TOMATO HYBRIDS AT THE MULTI-TIERED VEGETATIVE PIPE PLANT (MVTU) "FITOPYRAMIDA"

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Summary: *The technology of substrate-free, hydroponic cultivation of plants by air-conducting method, on multi-tiered vegetation pipe installations "Phytopyramida"has been developed. One of the advantages of the method is that due to the multi-tiered placement of as many plants as possible on one square meter of expensive greenhouse area, which will increase the output per square meter.*

Key words: *greenhouse, tomato, yield, innovation.*

Tomato is one of the most important horticultural crops and an important source of nutrients worldwide. Tomato ripening is a highly coordinated developmental process that coincides with seed maturation. Tomato is a climacteric fruit, with an absolute requirement for the phytohormone ethylene to ripen [1].

The word "hydroponics" comes from the two words "water" and "work", that is, "working solution". The name alone can help you understand the essence of this method – growing in an artificial environment, without soil. The hydroponic method appeared in the XX century, when the question arose about the need to develop new technologies. A lot of work has been done and since then there are many options for replacing the soil-water environment and porous environment (gravel, crushed stone, expanded clay, vermiculite), materials with high adsorption (mineral wool, perlite, zeolite) [2, 3].

Vertical farming then gave birth to the concept of pyramid gardening. Pyramid gardening is a new innovative concept of growing plants in a pyramid structures to maximize the use of space. One fine example of pyramid gardening is “The Pyramid Farm”. The Pyramid Farm is a design of a vertical farm envisioned by professors Eric Ellingsen and Dickson Despommier for the future of agriculture. The design is based on the growing belief that vertical farming will soon become a necessary lifeline in cities throughout the world [4].

Currently, the technology of substrate-free, hydroponic cultivation of plants by air-conducting method, on multi-tiered vegetation pipe installations "Phytopyramida"has been developed. This significantly reduces the cost of production and distinguishes this method from existing modern substrate hydroponic technologies. One of the advantages of the method is that due to the multi-tiered placement of as many plants as possible on one square meter of expensive greenhouse area, which will increase the output per square meter.

The main part of the technological equipment is a hydroponic multi-tier plant of the "Phytopyramid" type with a modular design scheme that allows installation in greenhouses of any type. Growing plants in completely isolated rooms with electric lighting (light culture of plants) allows you to exclude the influence of external factors and grow various plants year-round in the most comfortable conditions for them, and it means getting a high return from plants with high quality products. The light culture of plants is becoming relevant due to rapidly increasing climate change, remote regions with adverse and extreme climatic conditions, and also due to rapidly growing logistics costs.Light culture provides unique opportunities for selective use of light sources of different spectrum. By combining light sources with different spectral features, it is possible to control the growth and development of plants [5].

Phytopyramide is an installation for multi-tiered growing of plants in a substrate-free, air-conducting way. It is a frame on which vegetation pipes are placed on several tiers. The number of tiers depends on the type of plants being grown. Multi-tiered design makes it possible to use the area and volume of the greenhouse much more efficiently. With equal costs for heating and maintenance of the cultivation facility, the productivity of a unit of area with a multi-tiered method is much higher, which means that the profitability of production increases. Using the developed technology, various low-growth crops,such as tomato, eggplant, bell pepper,lettuce , green crops, and others can be grown successfully on the vegetation plant "Fi topiramida" [6] .

It is shown that in greenhouses with multi-tiered narrow-wall hydroponics, the most appropriate technological system of additional artificial irradiation of the "upper+lower" type, as providing a 52.7% higher yield [7].

Nutrient solution is fed into the vegetation pipes according to a certain program, while periodic flooding occurs the root system of the plant and it receives a full-fledged mineral food. When the nutrient solution level is cyclically lowered the plant receives root air nutrition the root "breathes". In such conditions, the plant does not need to fight for moisture and nutrition elements, nothing prevents the penetration of air to the roots, and the higher the aeration of the root volume, the faster a powerful root system is formed, which ensures rapid growth and development of the

plant itself. Aerial method of growing plants on installations "Fitoterapia" excludes the conditions of accumulation of excess amount of salts in the root volume. Plants do not experience the effects of soil pests and pathogens, and therefore do not need to fight them. All this has a positive impact on the productivity and environmental friendliness of productsm [6].

So, a net-house type cultivation structure has a whole a number of positive qualities, such as:

- Protection of plants and fruits from sunburn;
- Enhancing photosynthesis scattered, diffuse light;
-Special microclimate, significant mitigation of day and night differences temperature inside the structure, good ventilation of the entire volume without additional equipment applications;
-Significant water savings and reduced water distribution costs
-Infrastructure per unit of grown products;
- Protection from birds, hail, rain and strong wind;
- Protection from harmful insects and pathogens carried by them, no need for fungicidal treatments;
- A sharp reduction in the cost of pesticides and labor costs for their use;
- Vegetables do not contain residual amounts of pesticides;
- The possibility of cultivation of environmentally friendly products.

And installed in such multi-tiered vegetation structures installation " Fitopyramida" allow:

- To computerize and automate the production;
-Get much higher and more friendly yields, especially in the early season period, much earlier than in the open ground;
- Use mineral fertilizers more effectively;
-Significantly increase labor productivity and reduce labor costs per unit of production. At the same time, farms do not need fertile land, there is no need conduct crop rotations, purchase expensive agricultural products cars, trailers, attachments and spare parts, as well as fuel and lubricants for preparing arable land and processing plants. And the production itself can be expanded. put in close proximity to the consumer, thereby reducing the transport costs and crop losses [8].

Fig. Multi-tiered vegetative pipe plant "Fitopyramida"

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THE MULTI-TIERED VEGETATIVE PIPE PLANT (MVTU) "FITOPYRAMIDA" IS AN INNOVATIVE PROJECT IN THE AGRO-INDUSTRIAL COMPLEX OF THE RUSSIAN FEDERATION

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Summary: *More than five years of research and experimental work has allowed to obtain a very interesting result. We checked the tomatoes grown on the Fitopyramida plants. With a MPC of 300 mg / kg, the nitrate content in our case was 53.2 mg / kg, which is almost six times below the permissible value. The fruits have a characteristic tomato smell. The advantages of multi-tiered tomato cultivation are presented.*

Key words: *multi-tiering cultivation, tomato, yield, quality, innovation.*

Sudden changes in external conditions require the same quick response to maintain the balance of the system. But what can be done to radically change or at least correct the situation in the greenhouse business as soon as possible?

At the expense of new, non-traditional solutions, it is necessary to reduce the cost of producing greenhouse vegetables and significantly increase productivity.

It will focus on highly efficient growing of undersized plants using the example of tomato production.