



DETERMINATION OF FERTILITY OF HYDROPONIC SUBSTRATES IN THE EXAMPLE OF TOMATO PLANTS

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. Author MTB developed the research and supervised the scientific work, wrote the final draft of the manuscript. Authors SAN and MAD conducted the statistical analysis, wrote draft of the manuscript and performed literature review. Author XT conducted the literature search and collected data for the study. All authors read and approved the final manuscript.

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ABSTRACT

This study highlights the advantages and disadvantages of hydroponic greenhouses, to determine the viability of hydroponic substrates at home and to organize the implementation of their advantages in practice. No matter how advanced modern science and technology are, human life cannot be imagined without agricultural production. The created hydroponic greenhouses play a leading role in providing the population with quality food. The production and implementation of the necessary raw materials for such gardens is a requirement of today. In particular, hydroponics substrates are improving in our country and around the world.

Keywords: Hydroponics; substrate; coconut powder; biohumus; peat; sawdust (crushed wood powder); sand-gravel.

1. INTRODUCTION

Further expansion of the scope of hydroponics greenhouses, scientific substantiation of the results, the development of adaptation to local conditions.

Although hydroponics greenhouses are evolving in demand today, the term hydroponics is not a new term. The word "hydroponics" was coined in 1936 by Dr. VF Gerik of the University of California, Berkeley, with his sources on the cultivation of fruit and ornamental trees in salt water. In short, "hydros" means water, "ponos" means labor, work. Hydroponics is a method of growing plants in a soil-free, saturated aqueous nutrient medium [1,2,3]. There are several types of hydroponics methods used, which

differ in that they are performed on specific substrates. Substrate is a plural term that translates from Latin as "spoon, spoon method." In hydroponics, the base used as a substitute for soil in the cultivation of plants is the bedding [4,5]. Each hydroponics substrate has its own structure. These include: humus, peat, coconut shavings, sand-gravel, perlite, leca, perfect start, roskwool, vermiculite, mineral wool, inert chemicals: paralon, kapron, nylon or polyproline yarns [6].

Today, hydroponic gardens have been established in Israel, Korea, France, Russia and other leading countries of the world, especially in our country, and provide the population with food. Such gardens require a certain area and the necessary raw materials.

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Only then can the goal be achieved. Hydroponic greenhouses differ from other greenhouses in that they require high-cost raw materials and produce products based on quality, accurate results [7,6].

Purpose: to highlight the advantages and disadvantages of hydroponic greenhouses, to determine the viability of hydroponic substrates at home and to organize the implementation of their advantages in practice.

2. MATERIALS AND METHODS OF RESEARCH

The tomato plant obtained for the study was considered to be an object of the «Boron» variety, and observation, comparison, and experimental methods were used in this research. The study was carried out at a temperature of 20-25 degrees in greenhouse conditions. For growing tomato seeds, soil was used with the following mixtures: peat, coconut shavings, humus, sawdust and sand with gravel. The number of flower pots is 16. In each pot, 1 cup (in a small volume) of smaller stones was added to better circulate the air inside the pot. A mixture of the selected substrates and clean soil was laid on top in a 50:50 ratios.

3. RESULT AND DISCUSSION

The research work is to determine the fertility of hydroponics substrates at home and to put their advantages into practice. The study was conducted in a tomato plant, at room temperature. This is due to the fact that the tomato plant is a vegetable crop that plays a key role in the diet of the population. In addition, the technology of cultivation is quite convenient. The study was conducted in May. This required convenient and inexpensive home-made raw materials, tomato seeds, hydroponics substrates. The

research began with the adaptation of crates to accommodate vases.

The number of vases was 16, 4 in 2 boxes, 6 in 1 box and 2 in a separate place. 1 cup (small volume) of smaller sized stones was removed to allow air to circulate better inside the vases. On top of them was placed a mixture of selected substrates and clean soil in a ratio of 50:50. If only the substrates themselves were used in the experiment, the soil was also mixed as it could burn the seeds. Coconut chips, humus, peat, sawdust (crushed wood chips), sand and gravel substrates were used in the experiment. In the last two flowerbeds, only the soil itself was planted. The reason is to identify the differences and similarities in the fertility of the soil itself and the substrates.

After placing the soil and substrates in the pots, the tomato plant was planted with 6-8 seeds of «Boron» variety. More seeds were selected for the experiment to be fully implemented. The seeds were sown at the same time and the flowers were covered with a thin layer of salofan. A hole was drilled in the salofan to allow the seeds to breathe. We know that salofan-covered roses tend to forget earlier than open-air roses. The boxes were placed in a room environment at home.

The experiment began on May 2, and on May 10, the seeds began to germinate. The room temperature was 20 C0 in the morning and 22-23 C0 in the evening. On some days, the weather was cold and very hot. It was 18-19 C0 at low temperatures and 25 C0 at high temperatures. Every day, a glow in the pots was observed. No food was given until the seeds sprouted. This is because the seeds that are planted are watered, and the seeds germinate at the expense of their own nutrients, and for a while they begin to live on that nutrients. The tomato plant was light-loving, and the boxes were placed in a position where light was taken into account.



Fig. 1. Experimental protocol



Fig. 2. Placing the soil and substrates in the pots



Fig. 3. 4 pots with coconut husk

As can be seen from the pictures above, the brightness was very high in 2 pots with soil and 4 pots with coconut husk. Then 2 hummus-filled roses, as well as

roses with a sawdust substrate, shone well. Four peat pots and two sand-gravel pots had lower levels of glare.



Fig. 4. Growth stage

4. CONCLUSION

1. Peat evaporation from hydroponic substrates in peat was slower.
2. In coconut husks, the seeds germinate well and germinate quickly. The grass of the tomato plant was thinner and longer.
3. The humus substrate had high gloss and forgetfulness. The grass of the tomato plant is the same length, taller and stronger.
4. On a sandy-gravel substrate, the front glow was not noticeable. But the forgetfulness of the grass did not lag behind the humus.
5. The luster in the sawdust was moderate, and the yield was lower than in other substrates.
6. The germination of seeds sown in the soil was the highest. In forgetfulness, the substrates of humus, sand, gravel and coconut husk were able to level with the soil.

There were some exceptions because the study was conducted at room temperature for a short period of time. Humus and sand-gravel substrates have higher yields than the currently widely used coconut shavings substrate. It is worth noting that some

changes can be observed even before the tomato plant matures and bears fruit.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Websites:
Available: <https://ru.wikipedia.org/wiki/>
Available: <http://womanadvice.ru.gidroponika-v-domashnih-usloviyah-zelen>.
Available: <http://better-house.ru/dacha/gidroponnaya-ustanovka-svoimi-rukami/>
2. Sharma N, Acharya S, Kumar K, Singh N, Chaurasia OP. Hydroponics as an advanced technique for vegetable production: An overview. *Journal of Soil and Water Conservation*. 2018;17(4):364-371.
3. Asaduzzaman M, Talukder M, Tanaka H, Ueno M, Kawaguchi M, Yano S, Asao T. Production of low-potassium content melon through

- hydroponic nutrient management using perlite substrate. *Frontiers in Plant Science*. 2018;9: 1382.
4. Olubanjo OO, Alade AE. Growth and yield response of tomato plants grown under different substrates culture. *Journal of Sustainable Technology*. 2018;9(2).
 5. Klados E, Tzortzakis N. Effects of substrate and salinity in hydroponically grown *Cichorium spinosum*. *Journal of Soil Science and Plant Nutrition*. 2014;14(1):211-222.
 6. Tilavoldieva DX, Botirov MT. Method of hydroponics and historical, and modern! Materials of the Republican Scientific-Practical Conference. The role of innovation in improving the quality of medicine and education, Fergana; 2020.
 7. Teplitsy i parniki na dachnom uchastke Dimitri Antonov; 2017.