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ВЕСТНИК

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NAS RK is pleased to announce that Bulletin of NAS RK scientific journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of Bulletin of NAS RK in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential multidiscipline content to our community.

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STUDY OF THE INFLUENCE OF BIOREGULATORS ON THE PRODUCTIVITY AND DEVELOPMENT OF PLANTS GROWN BY HYDROPONICS

Abstract. In many regions of the Republic of Kazakhstan, the environmental situation is deteriorating. The total area of the territory of the Republic of Kazakhstan according to the land balance as of November 1, 2013 is 272.5 million hectares. In recent years, under the influence of natural and anthropogenic factors, the volume of pastures has increased per unit area, soil fertility has decreased, irrigation and rainwater nutrients have decreased, salinization and irrigation areas have decreased, crop yields have decreased, and water and soil pollution are increasing, and certain species of flora and fauna are at risk of extinction. Most of the Republic's territory is located in desert zones (60% of the territory). In agriculture, industry and everyday life, the role of hydroponics is increasing. One of the reasons for this is a reduction in the financial costs of tillage, protection from weeds and pests when using the hydroponics method, as well as an increase in a large number of plants on a limited landing site. Water and mineral fertilizers are spent more efficiently due to their repeated use. Growing plants using hydroponics is very profitable, since in a short period of time you can get a crop using year-round and small areas. Here, an important role is played not only by macro-and know the concentration of trace elements. As a result, plants do not realize their potential, and therefore do not always give a high-quality product. The use of hydroponics also reduces the financial costs of soil cultivation, protection from weeds and pests, and will increase the number of plants on the landing site with a limited volume.

Keywords: hydroponics, soil erosion, plants, nutrient medium, chemical elements, drainage, wick, air pump, agricultural products, irrigation.

Introduction. The role of hydroponics in agriculture, industry and everyday life is increasing. A special place in the structure of vegetable growing is occupied by growing vegetables and herbs using hydroponics. Green vegetables are valuable depending on the high need for vitamins, mineral salts, and other nutrients. Growing plants using hydroponics is very profitable, since in a short period of time you can get a crop using year-round and small areas. Here, an important role is played not only by macro-and know the concentration of trace elements. Since all plants need trace elements to create enzyme systems-biocatalysts, including iron, manganese, zinc, chalk, molybdenum, cobalt, etc. Scientists call them "elements of life", in the absence of these elements, the life of plants and animals is impossible. Lack of trace elements does not lead to the destruction of plants, but causes a decrease in the speed and sequence of processes responsible for the development of the body. As a result, plants do not realize their potential, and therefore do not always give a high-quality product. The use of hydroponics also reduces the financial costs of soil cultivation, protection from weeds and pests, and will increase the number of plants on the landing site with a limited volume. Water and mineral fertilizers are spent more efficiently due to their repeated use. You can control the growth of plants by changing the content of the nutrient solution, the concentration of oxygen in the solution, which increases productivity. Innovations of the traditional method acquired in the process of cultivating crops in agriculture, reduction of factors affecting the pollution of land and water resources, as well as the effectiveness of applying the method of hydroponics

in the country to the economy were demonstrated. Many hydroponics systems have been studied and found to have a positive effect on the process of cultivating crops cultivated in agriculture. In comparison with traditional methods of plant cultivation, hydroponics has a number of advantages. The plant receives the entire supply of nutrients in the required amount. This contributes to its rapid growth and healthy development. Fruit trees give a good harvest, and ornamental plants are characterized by abundant and long-lasting flowering. When growing plants without supervision, you can forget about such problems as drainage and overwork of the soil. Due to monitoring of water consumption, the amount of irrigation will be reduced. You can forget about daily irrigation by choosing a growing system. Depending on the amount of hydroponic capacity, watering is reduced twice a week to once a month. The plant absorbs the actual amount of fertilizers formed during watering. Having drawn up an irrigation scheme and calculated the required amount of fertilizers, you don't have to worry about it all the time. The use of a pesticide is not required. Plants grown in hydroponics are not afraid of soil pests, root rot and fungal diseases. The process of changing the place, containers of plants does not require extra effort and is easy to occur. The roots are not injured when transplanted, they do not need to be freed from the Ground. Just add the solution to the plant and put it in another bowl. Hydroponics is an economical way to grow plants, especially houseplants [1-3].

Before building a hydroponic system, it is important to first consider the type of plants that need to be grown in the system, as well as the space required for growing them. Then we need to make sure that you have designed the system in such a way as to meet the needs of the plants (number of plants, number of roots, oxygen for vessels, water consumption, etc.) Even after they have grown to their full size. Because one type of hydroponic system may be good for growing some types of plants, but it may not be the best choice for growing other crops [4-7]. However, the introduction of other types of hydroponic systems shows that the growth process is easy, small and inexpensive. In addition, when growing many types of plants, it is usually better to grow in different systems for certain crops, without trying to grow them in a large system [8-9].

Depending on the type or location of the hydroponic system and plant growth trends, the type of lighting is selected. By the time of the year, it is possible to use natural sunlight or artificial lighting for growing crops. If possible, use natural sunlight, which does not require the simplest, unnecessary consumption and additional equipment. However, if natural sunlight is not sufficient, the required light source is provided with artificial plant lighting [10-12] (table 1).

Table 1-Systems of hydroponics methods

Type of system	Substrate	Part	Recycling
Wick system	Yes	Compressor (optional)	No
Deep water culture	No	Compressor	No
Periodic flooding	Yes / No	Watermark + timer	Yes
Drip irrigation system	Yes	Compressor+water request	Yes
Nutritional benefits	Yes / No	Compressor+water request	Yes
Aeroponics (air culture)	No	Part of water	Yes

The substrate is one of the components of the hydroponics method. Some of its species are used not only for hydroponic cultivation, but also for conventional geo-political plant cultivation. Modern hydroponic systems have come a long way from using river gravel and sand in the very first systems. An ideal environment may include approximately the same concentration of water and air. The plant needs both oxygen and nutrition. The ability of the substrate to support water / air is determined by the space between the grains or fibers of the substrate. List of fertilizer sources for the nutrient solution. De studied the influence of the mineral composition of the nutrient solution of Rizhk and Sshrevens and substrate humidity on the mineral composition of hydroponic tomato fruits, "design and analysis of impurity systems", an expanded simplex grid with a common centering of the nutrient solution in the space of the cationic factor (K+, Ca2+ and Mg2+) [13]. Two substrate moisture contents (40 and 80% by volume) were studied for each nutrient composition (table 2).

Table 2 - List of the most commonly used fertilizers and acids in hydroponics
(as well as some characteristics of interest for use in plant nutrition)

Fertilizers	Formula	Percentage of nutrients	Solubility, g L^{-1} at 20 °C
Calcium nitrate	$Ca(NO_3)_2$ $5H_2O$	N:15,5; Ca:19	1290
Potassium nitrate	KNO_3	N:13;K:38	316
Magnesium nitrate	$Mg(NO_3)_2$ $6H_2O$	N:11; Mg:9	760
Ammonium nitrate	NH_4NO_3	N:35	1920
The monokaliy	KH_2PO_4	P:23; K:28	226
Monoammonium phosphate	$NH_4H_2PO_4$	N:12; P:60	365
Potassium sulphate	K_2SO_4	K:45; S:18	111
Magnesium sulphate	$MgSO_4$ $7H_2O$	Mg:10; S:13	335
Ammonium sulphate	$(NH_4)_2SO_4$	N:21; S:24	754
Potassium chloride	KCl	K:60; Cl:48	330

Methods of research. To get a good product, as indicated above, you must choose a normal, well-lit place. In the hydroponic method, strawberries need a temperature range of 57° **F** to 70° F (13.8° C to 21.1° C). If the amount of natural light is less or does not meet the deadlines, you must install lights with artificial lighting. Depending on the type of strawberry crop cultivated, special nutritional solutions for strawberries are produced and selected to ensure the ratio of specific nutrients.

The next step is selecting the tank. A large tub or bucket can be selected to work in the tank. It should be deep enough to hold a lot of nutrient solution. Also, strong and growing strawberry seedlings should be installed in containers in the upper part of the tank. The tank is filled with water and nutrient solution. Mixing nutrients with water should be performed in accordance with the instructions of the wick system of the hydroponic method. Special attention should be paid to the use of the necessary amount of water. Because too much or too little water directly depends on the correct maturation and fruit culture (figure1).

Although there are several ways to grow plants with hydroponics, using a wick system is the easiest way and requires fewer materials. It is also the most suitable and good system for growing small plants such as strawberries.

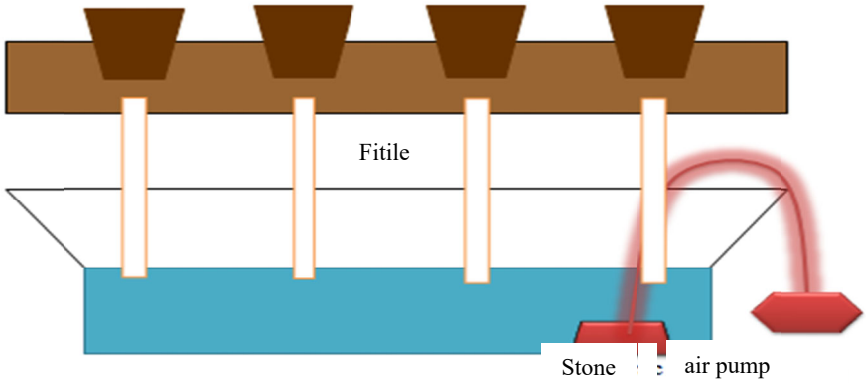


Figure 1- Diagram of a wick system

Results and discussion. As the plant grows, it grows through the substrate and the lattice basket supporting the roots, and continues to grow in the nutrient solution, providing a balanced set of plant nutrients and oxygen for maximum root development and green mass. To grow plants in multiple containers, it is necessary to develop a recycling system. Since checking each isolated system in this system can be caused by the strong labor and effort required to replenish the pH, nutrient levels, and stocks of "beer" plants. Recycling water in a circle helps not only to increase the volume of the solution, but also to maintain the concentration of nutrients, saturation of the water with pH and oxygen. Stable water circulation prevents any high concentration of mineral salts or increased concentration of acids in all amounts of solution in many small tanks.

Advantages of deep water culture:

1. Plant roots have a high effect on oxygen, which contributes to vascular development and overall plant growth.

2. Good aeration greatly increases water absorption, nutrient absorption, and cell growth.

3. It also prevents water stagnation, which can lead to vessel health, such as rot and Pythium.

The device of the deep-water culture system of the hydroponic method consists of the following parts. The system of deep-water culture consists of tanks, latticed thieves or glasses (depending on the intensity and volume of growth of the selected culture), an air infusion pump, and an air line.

Currently, pipelines presented on the construction market are made of the following polymers: polyethylene, polypropylene, polyvinyl chloride, polyvinyl chloride. The most popular material for modern sewer systems is PVC pipes. These pipes are resistant to all aggressive substances found in the surrounding soil, industrial and domestic wastewater. In the course of research, it was very convenient to use PVC pipes as buoyancy, able to fix the glasses with the plant and freely walk in the water exchange. We also increased the advantages of using this type of pipeline, since part of the root system must be located directly in a place where there is no source of sun.

Plastic cups were removed as a plant placement chamber, and holes for mounting are made from the PVC pipe specially made above. To supply water to the lower side of the glasses, holes are made before installation, as shown in the figure. After our glasses are ready, we prepare the pump. The operation of the pump is very important. The pump does not need to pulsate by saturating the water with air. If the compressors and recirculating pumps are switched off, there is a risk of a significant decrease in oxygen at one time.

The next step is to prepare the substrate. As a substrate, expanded clay granules are ideal in a deep water culture system. Expanded clay granules have a wide range of sizes and provide good aeration of neutral pH and root. Also, marble stone was chosen as the second substrate as a comparative one. Currently, due to obtaining the status of the Turkestan region, mass construction is underway. As a result many remnants of marble stones are removed.

After selecting the Substrate, we grind it in an amount of 3-5 mm, acceptable for strengthening vegetation. Crushed clay and marble stone are placed on the bottom of the glasses. In the next stage, we prepare a tank that will house the water / air heater. As a reservoir, a plastic container with a capacity of 20-25 liters, a standard trapezoid was purchased. After all the items needed for the deep-water culture system are prepared, we produce the selected plant seeds. In our practical work, cucumbers – representatives of vegetable culture-were selected for the study.

Leave the cucumber seeds for 5-10 minutes with water from the pipe. We remove pop-UPS on the surface and place them on cotton disks to be convenient for their production. The average length of the seed is 0.5-0.8 cm. Leave for 2-3 days at room temperature, which will not get directly into the sun. Seeds of grown cucumbers are transferred to a pre-prepared growing chamber.

Before placing the growing chamber in the tank to fix the plants, add a water system. In the tank for placing water, pour water with a volume of 15-20 liters, add a pump to supply water to the tank for attaching plants. After the system, as shown in the above diagram, is ready, we have a growing chamber.

The first two days we examine the vegetation through water from the pipeline. And when the length of the cucumber undergrowth is 2.5-3.5 cm, we prepare a pot in the tank where the water is located. A positive solution is to use organic substances rich in micro-and macro-elements listed in the table below. Therefore, the method of hydroponics provided for the use of eggshells in the system of deep-sea culture.

The value of eggshells as fertilizers depends on the high cost of calcium and other micro-and macronutrients needed for garden crops for healthy development and good fruit production. You can feed potatoes, bell peppers, eggplant, cauliflower. But the most popular fertilizer is obtained as a means of increasing the productivity of cucumbers and tomatoes.

It also participates in the following processes:

The saturation of urine with calcium. The shell includes a large concentration of this element and most importantly-in a form that is easily digested by plants.

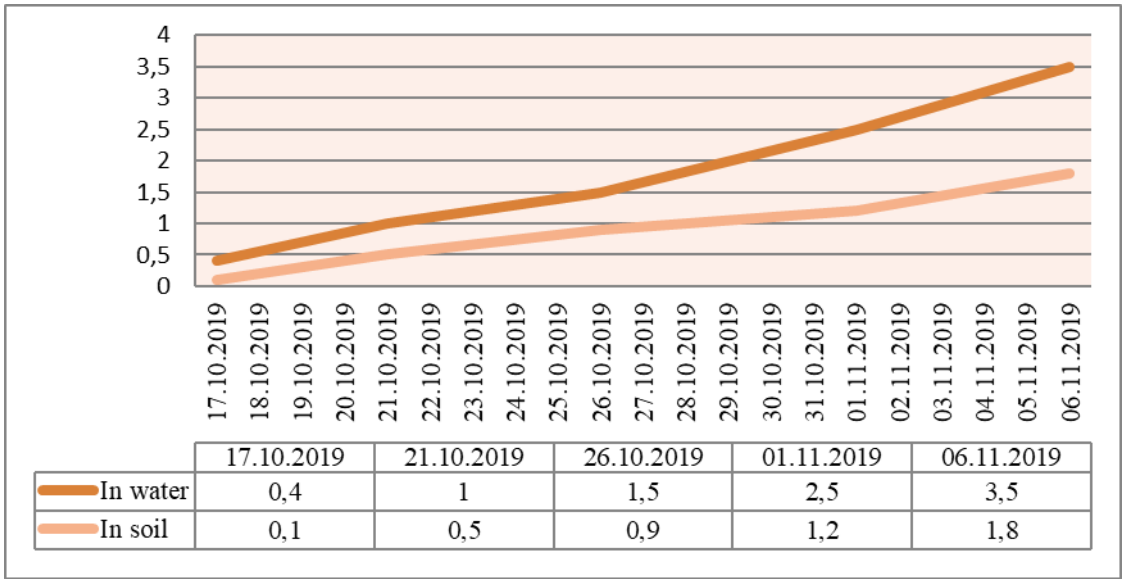
Reduced caloric intake. Cucumbers and tomatoes require growth in a neutral or slightly acidic environment. The advantage of bark over means for limestone, such as chalk or lime, is that it is "accepted" faster.

Improving the structure. In the process of development of the germinating vascular system, it is necessary to ensure evenly developing and territorial needs.

For fertilizer, you must keep in mind that you can use not only the shell of a chicken egg, but also "products" from any poultry. Quail eggs are considered the most useful, since their shell contains the largest amount of trace elements.

At the same time, due to the high temperature when cooking eggs, there is a danger of losing some of the useful substances, raw shells are considered very valuable and are used for growing more than 90% of plant seedlings. However, it is recommended to heat the raw materials in the oven-in this case, the amount of losses is compensated by active calcium release. When preparing raw materials, it should be focused on the amount of planting material. The positive effect of drying or heating in the oven, this process prevents the spread of bacteria and fungi that can start rotten processes, or is based on complete elimination (table 3).

Table 3 - diagram of growth rates of undergrowth in the ground and water environment



	17.10.2019	21.10.2019	26.10.2019	01.11.2019	06.11.2019
In water	0,4	1	1,5	2,5	3,5
In soil	0,1	0,5	0,9	1,2	1,8

It is known that it is very difficult to get a quality product without timely application of fertilizers and good care for the grown plants. We also considered alternative options, rejecting known chemical additives in order to preserve the quality of the grown products and not cause harm to health. It provides for the use of substances rich in trace elements, organic substances, as well as recognized as residues. And as an alternative fertilizer, we used banana peel, which is suitable for this characteristic. This is an effective tool that, when used correctly, increases the product by 40-50%.

Conclusion. In recent years, under the influence of natural and anthropogenic factors, the volume of pastures has increased per unit area, soil fertility has decreased, irrigation and rainwater nutrients have decreased, salinization and irrigation areas have decreased, crop yields have decreased, and water and soil pollution are increasing, and certain species of flora and fauna are at risk of extinction. Most of the Republic's territory is located in desert and desert zones (60% of the territory). They wear out at different levels and are subject to desertification, only $ 30 million. about 3 million hectares of land are inhabited by France sand, and saline land-34 million ha. more. During cultivation, it is dissolved with firm attention and checked for acidity. the normal pH level is 5.5-6.5, but may vary in individual cultures. If the acidity is disturbed, the vegetation may be disrupted or die by the growth process, which cannot fully absorb elements from the water. An important role is played at the temperature of the working solution. The temperature should be within +18...+24 °C. Each plant species has a minimum, optimal, and maximum temperature for growth, which requires the introduction of heating or cooling systems to balance the temperature of the nutrient solution. When the temperature rises, the oxygen level in the water decreases

and plants consume a lot of fertilizers. If the temperature drops, the oxygen will be more and the plants need small elements.

At present, 17 elements are necessary for many plants: carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, copper, zinc, manganese, molybdenum, chalk, chlorine and Nickel. The main elements, with the exception of carbon (C) and oxygen (O) coming from the atmosphere, are taken from the nutrient medium. Other elements, such as Sodium, silicon, vanadium, selenium, cobalt, aluminum, and iodine, are considered useful because some of them can stimulate growth or compensate for the toxic effects of other elements, or replace essential nutrients in a lesser special role. The main nutrient solutions are nitrogen, phosphorus, potassium, calcium, magnesium and sulfur, which are supplemented with trace elements.

The value of eggshells as fertilizers depends on the high cost of calcium and other micro-and macronutrients needed for garden crops for healthy development and good fruit production. In the study, the growth rate was increased by 2 days after the introduction of crushed eggshells into adolescents. And so the basis of the undergrowth is delayed. When fertilizing an eggshell, it is better to use it for feeding the root. Because the egg shell not only nourishes plant growth, but also has a good effect on their quality. Banana shell is an absolutely natural product, which in its composition is no less than many complex mineral additives intended for feeding. Banana shell is a natural product that is not less than numerous complex mineral additives intended for feeding. Because it contains potassium salt, magnesium compounds, phosphorus and other organic nutrients, it is involved in many growing processes. For example: it helps to grow the potash-root system, correctly "allocates" nutrients and water, which contributes to the overall strengthening of the culture, participates in phosphorus-photosynthetic processes, increases the percentage of germination and ensures the formation of full-fledged seeds. At the same time, the introduction of the hydroponics method in agriculture is not only ecological, but also cost-effective. For example, using small funds (1000-1500 tenge) from 0.28 square meters to 10-12, which allows you to get 100-120 net products. The possibility of using agricultural and household waste as secondary fertilizers, and the departure from the method of hydroponics can be used as a fertilizer in the reclamation of soil horizons, since the departure from the method of hydroponics is only a liquid.

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ГИДРОПОНИКА ӘДІСІМЕН ӨСІРІЛГЕН ӨСІМДІКТЕРДІҢ ДАМУЫ МЕН ӨНІМДІЛІГІНЕ БИОРЕТТЕГІШТЕР ӘСЕРІ

Аннотация. Қазақстан Республикасының көптеген өңірлерінде экологиялық ахуал нашарлауда. Қазақстан Республикасы аумағының жалпы алаңы 2013 жылғы 1 қарашадағы жер балансының деректері бойынша 272,5 млн га құрайды, соңғы жылдары табиғи және антропогендік факторлардың әсерінен жайылым көлемі алаң бірлігіне артты, топырақ құнарлылығы төмендеді, суару және жаңбыр суы үшін қоректік заттар азайды, тұздану және суару алаңдары азайды, ауыл шаруашылығы дақылдарының шығымдылығы төмендеді, су мен топырақтың ластануы өсті, ал флора мен фаунаның кейбір түрлері жойылып кету қаупі төніп тұр. Республика аумағының басым бөлігі шөлді аймақтарда (аумақтың 60%) орналасқан. Ауыл шаруашылығында, өнеркәсіпте және күнделікті өмірде гидропониканың рөлі артып келеді. Мұның себептерінің бірі-гидропоника әдісін қолдану кезінде топырақты өңдеуге, арамшөптер мен зиянкестерден қорғауға қаржылық шығындардың төмендеуі, сондай-ақ шектеулі отырғызу алаңында көптеген Өсімдіктердің көбеюі. Су мен минералды тыңайтқыштар оларды қайта пайдалану арқылы тиімді жұмсалады. Гидропоника көмегімен өсімдіктерді өсіру өте тиімді, өйткені қысқа уақыт ішінде сіз жыл бойы және шағын аудандарды пайдаланып егін жинай аласыз. Мұнда макро ғана маңызды рөл атқармайды, бірақ микроэлементтердің концентрациясын білу керек. Нәтижесінде өсімдіктер өз әлеуетін іске асырмайды, сондықтан әрқашан сапалы өнім бермейді. Гидропониканы қолдану сонымен қатар топырақты өңдеуге, арамшөптер мен зиянкестерден қорғауға кететін қаржылық шығындарды азайтады, сонымен қатар шектеулі көлемдегі отырғызу алаңындағы өсімдіктер санын көбейтеді.

Түйін сөздер: гидропоника, топырақ эрозиясы, өсімдіктер, қоректік орта, химиялық элементтер, дренаж, фитиль, ауа сорғысы, ауылшаруашылық өнімдері, суару.

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ИЗУЧЕНИЕ ВЛИЯНИЯ БИОРЕГУЛЯТОРОВ НА ПРОДУКТИВНОСТЬ И РАЗВИТИЕ РАСТЕНИЙ, ВЫРАЩИВАЕМЫХ МЕТОДОМ ГИДРОПОНИКИ

Аннотация. Во многих регионах Республики Казахстан ухудшается экологическая ситуация. Общая площадь территории Республики Казахстан по данным земельного баланса на 1 ноября 2013 года составляет 272,5 млн га. В последние годы под влиянием природных и антропогенных факторов увеличился объем пастбищ на единицу площади, снизилось плодородие почв, снизились питательные вещества для орошения и дождевой воды, уменьшились площади засоления и орошения, снизились урожаи сельскохозяйственных культур, возросло загрязнение воды и почвы, а некоторые виды флоры и фауны находятся под угрозой исчезновения. Большая часть территории Республики расположена в пустынных зонах (60% территории). В сельском хозяйстве, промышленности и повседневной жизни возрастает роль гидропоники. Одной из причин этого является снижение финансовых затрат на обработку почвы, защиту от сорняков и вредителей при использовании метода гидропоники, а также увеличение большого количества растений на ограниченном посадочном участке. Вода и минеральные удобрения расходуются более эффективно за счет их многократного использования. Выращивать растения с помощью гидропоники очень выгодно, так как за короткий промежуток времени можно получить урожай, используя круглогодичные и небольшие площади. Здесь важную роль играет не только макро-, но надо знать и концентрацию микроэлементов. В результате растения не реализуют свой потенциал, а потому не всегда дают качественный продукт. Использование гидропоники также снизит финансовые затраты на обработку почвы, защиту от сорняков и вредителей, а также увеличит количество растений на посадочной площадке с ограниченным объемом.

Ключевые слова: гидропоника, эрозия почв, растения, питательная среда, химические элементы, дренаж, фитиль, воздушный насос, агропродукты, орошение.

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