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TITLE: HYDROPONIC: SOIL LESS FARMING

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Abstract

This paper reviews about hydroponic which serve as a boon in today scenario. The traditional method in our country of food cultivation comprises mainly of agriculture. About 31.55 of total rural population are involved in farming. Due to rapid urbanization and industrialization, poor soil fertility, deforestation, droughts, lack of water due to scarcity in rainfall, rise in temperature, and decline in ground water level have affected the food production. If this continues, then it might be impossible to feed all the population of our country at once. So, it is relevant to use new technique of soil less culture basically HYDROPONIC. In this culture, the plants are raised without soil, this culture have further advantages in improved space and water conserving. This is also effective method of water treatment. The water required in this technique is just 5-10%—as compared to land crops. It also gives higher yield when compared to traditional methods. The traditional method in our country involves the treatment of water in ETP. This water is then drained in to the ponds, rivers and other water reservoirs. Sometimes, the waste water is collected in same reservoir, usually in an industrial development corporation area. There may be chances of water contamination resulting into precipitate formation, to avoid this scenario; the hydroponic principle can be applied. Hydroponics is growing plants without soil. The plant gets nutrients from the waste water.

Index Terms: Hydroponic, ETP, Precipitate Formation, Soil less culture, etc.

Introduction:

The hydroponics is a principle of cultivation of crops, plants without use of soil. Hydroponics now used in the United States and around the world. In hydroponics water is used instead of soil. Nutrients which are required by plants is added in water so that cultivation of crops can be done.

Hydroponics is a method of hydro culture, in which plants grow without soil by using mineral nutrient solutions in a water solvent. Terrestrial plants can be grown with only their roots exposed to the mineral solution, or the roots may be supported by an inert medium, such as gravel or perlite.

In 1699, John Woodward has published his experiments on water culture with spearmint, which revealed that plants in less-pure water sources grew better than plants in distilled water. The word Hydroponic is a combination of two Greek words meaning water and toil. The method of hydroponic is used in various countries because some cultivators who utilize this method have found that they get yields much than the conventional methods. As, the hydroponically grown plants

dip their roots directly into mineral-rich solutions, they get the required nutrients much more easily than plants that are grown in soil, as a result they need much smaller root systems and they can divert more energy into leaf and stem growth. As, a result they require smaller area. Hence, it can be grown into smaller areas such as, greenhouse or on a balcony or window-ledge inside. It is one of the best methods for indoor growing and as there are no climatic restrictions, the plants can be grown all the year around.

As the plants make their own nutrients, so it doesn't matter if the plants are grown in the soil or hydroponically, they have the same vitamin contents. Only, the mineral content depends upon the type of solution that is employed.

Hydroponic mineral solutions are made of mineral salts which they dissolve in water. The strength of the mineral solution can be detected by monitoring the electrical conductivity of the solution. Higher electrical conductivity values indicate the higher ionic (salt) concentrations.

Also, the plants ability to absorb the nutrients from the soil depends upon its pH. As, when there is acidic solution it promotes the absorption of minerals like aluminum, hydrogen, and manganese. But, when a solution is too acidic, the excess absorption of these elements can be toxic to the plant. Conversely, at basic pH, calcium and magnesium are not fully absorbed. The same for alkaline environments, in which the availability of molybdenum and macronutrients is increased, while the availability of phosphorus, iron, zinc, copper and cobalt is decreased. The pH range between 5.5 to 7.5 is most favourable.

1.1 Types of hydroponics

There are basically two types of hydroponic which are :

- Active Hydroponic System
- Passive Hydroponic System

The active hydroponic system involves the use of pumps, timers and automatic complexes. The passive hydroponic system doesn't include the use of mechanical equipment. There are various kinds of hydroponic systems:

- a wick system (passive system);
- a water culture (active system),
- a flood and drain(active system),
- the drip systems (active system),
- a nutrient film technique (active system),
- an aeroponic (active system).

1.2 Advantages of hydroponic

- This method of hydroponic does not require soil which is the biggest advantage of this method. As the crop can be grown anywhere even at the places where the land is limited, or maybe it is highly polluted. As a result it has been considered as the 'Farming of the future', As it can be used for growing foods for astronauts by NASA in space.
- Another biggest advantage of this method is that it makes better use of space; it can be grown small apartments. As, the plant grown with this technique do not have to search for nutrients as a result the roots are shorter. Hence, it is a space saver.
- There are no climatic restrictions as a result the plant can be grown all the year round regardless of the season. Hence it can be very useful to farmers as they can maximised there business profit using this unique method.
- The methods of hydroponic is water saving this method only uses about 8 to 10% of water use in agriculture as the water in this method is recirculated the plants takes the water according to the requirement while returns the unnecessary water back to the system. Hence it is a viable solution of saving water.
- In this method there is effective use of nutrients as all the nutrients are conserved in the tank use hence there are no losses and 100% utilization of nutrients

- It is easy to adjust and measure the pH level as compared to soil, this ensures optimal nutrients uptake
- The plant grown with the method of hydroponic shows better growth rate when they are placed in ideal conditions.
- As there is no need of soil, there are no weeds. As weeds are associated with soil.
- The plants are protected from the disease like Fusarium, Pythium and Rhizoctonia species and also vulnerable to soil borne pests like birds, gophers and groundhogs.
- Since, no soil is used the plants are more vulnerable to weed, pests and plant disease, the chemicals used are very less. Thus, the plants grown using this technique are more chemical free.
- This method also takes less efforts and time when compare to traditional method of agriculture.
- Commercially, hydroponics tends to consume only 1/5 of the land needed for the same amount of plants being cultivated on farmland.



Fig-1: Advantages of Hydroponics

Source of image:

<https://www.greenandvibrant.com/advantages-disadvantages-of-hydroponics>

1.3 Drawbacks:

- The biggest drawback of this method is that the person using this method should have technical knowledge and experience about this.
- The operational cost of this method is high.
- The waste nutritional solution when released directly into the environment may have ill-effects on the environment.
- The initial expenses for this technique are high such as, the containers, lights, a pump, a timer, growing media, a timer, growing media and nutrients.

2. Water pollution control by hydroponics

Hydroponic can be a efficient method for the treatment of waste water as well. The industrial water from various industries is first treated in the effluent treatment plant and then is released directly into the water reservoirs. The water reservoirs such as ponds, lakes are at the verge of being contaminated due the waste water. This, may result into the growth of algae and thus into eutrophication, which have it own ill effects as it result into decrease in the oxygen level of the reservoir and thus is a threat to aquatic life.

This water needs to be treated and the principle of hydroponic can be applied in such cases. The plants can be grown on such waste water and they absorb the minerals and the nutrients from the waste water.

2.1. Application of hydroponic in Bengaluru Lake

- One such example of the waste water from the industries contaminating the water reservoir was observed in Bengaluru.
- The waste water from three to four industries treated in the Effluent treatment plant was directly poured into the a lake.
- This resulted into precipitate formation.
- It was a hazard and threat to the aquatic life.
- Thus, Usha Rajagopalan have conceived the project in which she had used this technique of hydroponic and thus a remarkable improve was observed in the lake.
- This was referred as 'FLOATING GARDEN'
- It was manufactured using the common polyvinyl chloride pipes and thus discarded 1 litre PET bottles.
- The species that were grown in this lake were nutrient absorbing species such as vetiver, canna and colocasia.
- They were grown by absorbing pollutant in the water.
- The volunteers of the BMS College of Engineering have tested the water which have revealed the result which showed improvement in various parameters and slight improvement was observed.
- The amount of oxygen was raised by a third in 3 to 4 months.
- Thus, this have provided a very good method of protecting our lakes which are under threat of contamination due to industrial waste water.



Fig-2: Bengaluru Lake - Before and after

Source of image:

(<https://www.thebetterindia.com/116976/bengaluru-lakes-revive-united-way-bengaluru/>)

3. CONCLUSION:

- The technique of hydroponics is efficient, and eco-friendly.
- It may require time for cleaning the reservoirs but it is efficient and helps local communities to provide the jobs.
- The techniques help for maintaining the biodiversity near the water reservoirs.
- After cleaning the water reservoirs, water from reservoirs can also be used for fish cultivation, farming purposes, etc.
- Thus, this technique can be very efficient when Recently, natural resources like soil and water have become scarce, hence it can be great method for crop cultivation.

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