GOVERNMET DEGREE COLLEGE,DHARPALLY

NIZAMABAD-DIST

503165

DEPARTMENT OF BOTANY

STUDENT STUDY PROJECT

TITLE: HYDROPONICS – A SOLUTION TO MANY MODERN PROBLEMS

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GOVERNMENT DEGREE COLLEGE - DHARPALLY

NIZAMABAD

CERTIFICATE

This is to certify that the student project entitled '**Hydroponics –A Solutions to many modern problems'** is carried by bonafide students of B.Sc (BZC)III year for the academic year 2020-21.

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INTRODUCTION:

Hydroponics is a method of growing plants without using soil. This technique instead uses a mineral nutrient solution in a water solvent, allowing the nutrient uptake process to be more efficient than using soil.

The word hydroponics comes from the roots "hydro" meaning water and "phones" meaning labor, this method of gardening does not use soil.

The earliest modern reference to hydroponics was by a man named "William Fredrick Gericke" .while working at the University of California, Berkeley he began to popularize the idea that plants could be grown in a solution of nutrients and water instead of soil. Naturally the general public, as well as William's colleagues doubted this claim. He quickly proved them wrong by growing 25 foot height tomato vines using only water and nutrients. He decided to call this growing method as hydroponics. The shocking results of Gericke's experiments with tomatoes prompted further research into the field. More research was performed by university of California scientists, who uncovered a great deal of benefits related to soilless plant cultivation.

Hydroponics gains its significance by conserving water. When growing plants in soil, a grower has to be very experienced to know about the quantity of water to be supplied to plants and check whether aeration for proper root growth is facilitated or not. Hydroponics solves this problem in two different ways. First, the water reservoir can be constantly oxygenated, making sure that the plants roots obtain the optimum level of oxygen. Additionally, the problem of watering is solved by the fact that the plants root system no longer has soil surrounding it, blocking oxygen uptake by the roots. Second, hydroponics uses much less water than soil farming because it can be re-circulated. Hydroponics allows for the unused water to be recycled back in the reservoir, ready for use in the future. In dry and arid areas, this is a massive benefit.

Over flowing of tanks in houses results in wastage of lot of water. This can be overcome by hydroponics, by connecting water tanks directly to hydroponic set up.

In urban areas, towns and cities where very less space is available to grow plants, hydroponics becomes a solution for it as it can be set even in space available in balcony of an apartment.

By this hydroponic technique we can easily identify mineral deficiency disease symptoms of a plant and the same may be treated as early as possible by dissolving these mineral nutrients in water medium. Thus Nutrient deficiency in plants can be avoided.

In this technique there is no usage of artificial fertilizers. It highly encourages organic farming using natural fertilizers.

DIFFERENT AVAILABLE TECHNIQUES FOR SOIL-LESS CULTURE

Large numbers of hydroponic/soil-less culture techniques are available. However, following factors are considered in selecting a technique:

1. Space and other available resources
2. Expected productivity
3. Availability of suitable growing medium
4. Expected quality of the produce – colour, appearance, free from pesticides, etc.

We can classify the techniques as follows:

Techniques of hydroponics

It is also known as **Liquid Hydroponics method**. Plants grown in solution culture have their roots suspended directly in a nutrient solution. It can further be classified into

A. **Circulating methods (closed system)/ Continuous flow solution culture**

a) Nutrient film technique (NFT)

b) Deep flow technique (DFT)

Flowing solution culture systems can provide a consistent nutrient environment for roots. **They are highly amenable to automatic control but are subject to rapid plant desiccation if the flow of solution stops for any reason. Thus frequent attention is required.**

B. **Non-circulating method (open systems)/ Static solution culture**

a) **Root dipping technique**

b) Floating technique

c) Capillary action technique

Suitable vessels for static systems include polythene beakers, pots, glass jar and containers lined with black polythene film.

Media culture

The media culture method has a solid medium for the roots and is named for the type of inert medium, e.g. sand culture, gravel culture or rock wool culture. There are two main variations for each medium, sub-irrigation and top-irrigation. However, it is classified as follows:

1. Hanging bag technique
2. Grow bag technique
3. Trench or trough technique
4. **Pot technique**

usually practiced in protected structures and is suitable for low leafy vegetables like lettuce, spinach, etc. There are two techniques under this group:

1. Root mist technique
2. Fog feed technique

SUPPLY OF NUTRIENTS TO THE PLANTS:

In hydroponics, because of limited nutrient-buffering capacity of the system and the ability to make rapid changes, careful monitoring of the system in necessary. Two aspects of nutrition need to be considered: the supply of nutrients from the nutrient delivery system and the plant nutrient response. For most common crop plants critical levels for most nutrients have been determined.

DESIRABLE pH RANGE OF NUTRIENT SOLUTIONS:

In hydroponic systems, pH is constantly changing as the plant grows. Changes in pH of less than 0.1 unit are not significant. Thus pH control is a necessity in hydroponic solutions. The pH range of 5.5 to 6.5 is optimal for the availability of nutrients from most nutrient solutions for most species, but species differ significantly and several can grow well outside of this range.

CONTROL OF CONTAMINANTS:

Maintenance of sterile root-zone environment is essential to have good plant vigour under soil-less culture. It is extremely difficult to minimize population of plant pathogens in the root zone.

[illegible] destroys all but the main roots. No effective fungicides are there which can be safely used in hydroponics. Only Metalaxyl has been found highly effective for control of Pythium on vegetable crops, but it is not registered for the use. Heat treatment of nutrient solution has also been found effective in keeping the root-zone free of pathogens. Root death of tomatoes by Pythium was overcome by heating nutrient solutions at 20- 22°C .

ADVANTAGES:

-Hydroponics can be a **solution to overcome water wastage** through over flowing of water from tanks.

-**It occupies less space** in comparison to soil based garden.

-It provides **a sterile environment** for plant production. This technique **does not require pesticides, fertilizers and other chemicals.**

- There is more **scope to reduce the damage** caused to plant due to **soil borne infections** or pests.

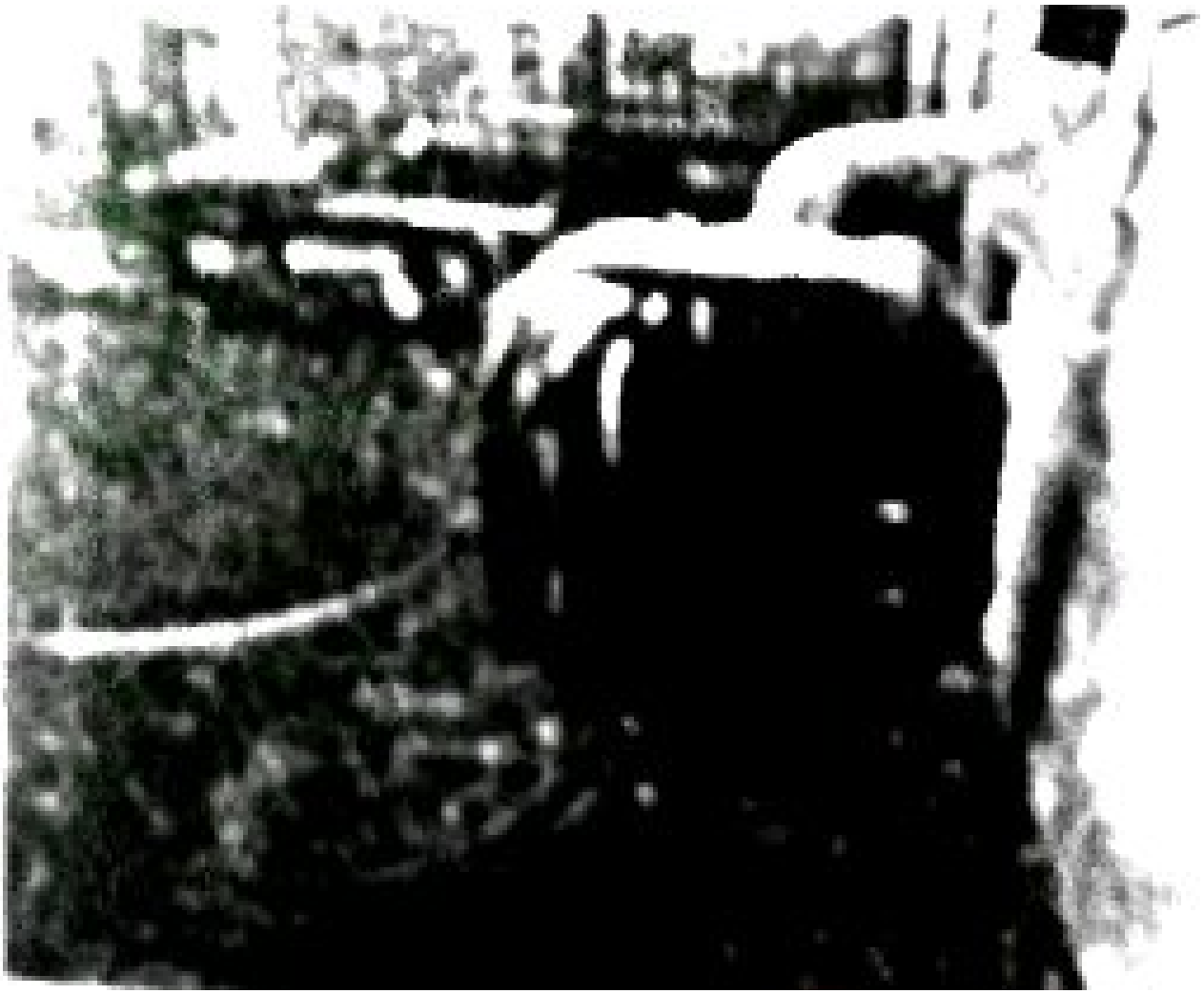
-It highly **promotes organic farming** of plants.

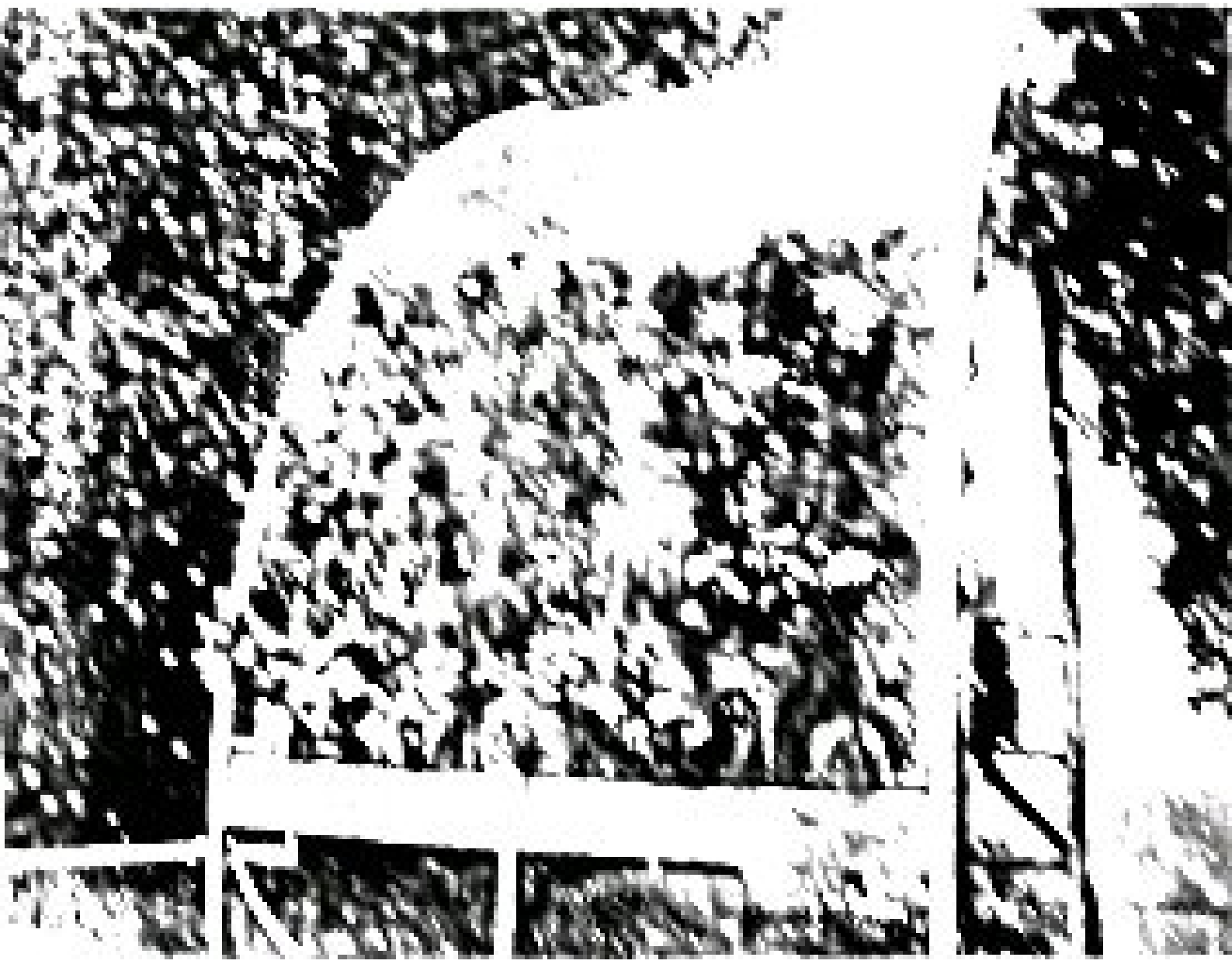
-Nutrient **deficiency symptoms** of plant can be **easily identified.**

-It **helps** in **studying nutrient deficiency** of plants and also gives solutions to the plant diseases.

-Crop grows **two times faster** in hydroponic gardening as it provides controlled environment.

-It uses only **1/20th part of water** compared to traditional gardening (soil-based gardening).





METHODOLOGY:

RAW MATERIALS USED:

To construct a hydroponic set up we need four 3.5 feet length and 4"breadth PVC pipes, coco peat and vermiculate in 2:1 ratio, plastic glasses, five couplings, ten bends, water tank and motor.

PROCEDURE:

First location to set up the hydroponic system is selected. The floor of place selected was leveled to ensure even supplying of water and nutrients to the plants in the system.

ASSEMBLAGE OF THE HYDROPONIC SYSTEM:

The system consists of six growing tubes made of PVC pipes, these pipes are connected to each other by couplings and bends. The gap between two pipes is approx .5 feet to 1 feet .Now, holes are made in the pipe by heating a iron rod and it was made sure that the plastic glass to grow the plants fit in the holes. A distance of 4cm between two holes is maintained. Each growing tube or PVC pipe has one inlet and one outlet for water supply. The entire set up on a stand is arranged and placed in green hose of the department .Now, a tank and a pump with pipe are attached, the tank is arranged under the table of growing tubes or PVC pipes and nutrients are supplied through these pipes. (Or else we can connect this entire system to tank in house to conserve over-flowing of water). The tank filled with water with the help of motor pumps the water into the growing tubes where the plants absorb water as much as they need and remaining water returns in to the tank. Thus, recycling of water takes place.

Plastic glasses taken were filled in with 2:1 ratio of coco peat and vermiculate. Witn the help of a needle 4-5 holes were made on the glass. Seeds were sown in the experimental glasses. One of the easiest ways to plant a hydroponic garden is to use purchased seedlings or grow the seeds yourself if you have time.

Now, these plastic glasses were kept in the holes of PVC pipes or growing tubes, make

GROWTH PARAMETERS IN DIFFERENT MEDIA(In centimeters)											
1.FENUGREEK(Methi)											
Day	1	2	3	4	5	6	7	8	9	10	11
1.In Hydroponic	0	0.4	0.8	1	1.5	2.5	3.5	4	4.5	5	
(Coirpeat&Vermiculate)											
2.In Pot 1.	0	0	0.3	0.8	1	1.5	2	2.5	3	4	
(coir peat&Vermiculate)											
3.In Pot 2.	0	0	0	G.started	0.5	1	1.5	2	2.5	3	
(soil only)											
2.CORIANDER											
Day	1	2	3	4	5	6	7	8	9	10	11
1.In Hydroponic	0	0	0	0	0	0	G.Started	0.3	0.4	0.5	
(Coir peat&Vermiculate)											
2.In Pot 1	0	0	0	0	0	0	0	0	0	0	
(Coir peat&Vermiculate)											
3.In Pot 2	0	0	0	0	0	0	0	0	0	0	
(Soil only)