HYDROPONIC PLANT

NATIONAL SCIENCE FAIR RESEARCH PAPER

LEVEL : PRIMARY LEVEL

CATEGORY : LIFE SCIENCE

SUBMITTED BY

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Abstract

As we all know that day by day we are facing land and water scarcity, which are the main element of agriculture.

“Hydroponic , a soilless cultivation technique, offers a promising solution to modern agricultural challenges such as soil degradation and water scarcity. It is a method of growing plants using nutrients rich water with sunlight . this method of farming can be extremely helpful to countries that have poor land or facing water scarcity.

1. Project ID and Title :

Project ID : NSF – SCH – 2025- 169

Project title : HYDROPONIC PLANT

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City and State : VANIYAMBADI , TAMILNADU

2. INTRODUCTION:-

Hydroponic is a method for cultivating plant without using soil. Instead the roots are typically suspended in nutrient rich water. However, this method requires other planting media such as gravel sand, coconut fiber broken rocks or foam. In addition to light, carbon dioxide and water plants require additional nutrients, which are observed by the roots. Thus plants grow faster compared to soil.

STATEMENT OF THE PROBLEM

Because of land pollution day by day soil is becoming infertile increase in pollution causes land crisis, specially in urban areas due to lack of water and less Plantation. People, breathe polluted air. Hydroponic farming consumes 80% less water compare to land farming. Absolutely no need of soil, faster grow.

HYPOTHESIS

Plants can grow better and faster in nutrient rich water.

DESIGN OF STUDY

INDEPENDENT VARIABLE:

Nutrient solution

Dependent variable:-

Growth of plant :- Height of plant, size of leaves

Controlled variable :-

⇒ pH level ⇒Light ⇒Temperature

3. METHODS:-

How does a hydroponic system work?

There are 6 type of hydroponic system. In this study of thesis I have used **Deep Water Culture (DWC)**. In this system plants roots are suspended in a deep tank of nutrient rich water.

Procedure:-

I have used reverse osmosis (RO) water for this system, with nutrient solution I have added 5 ml of concentrated nutrient A solution and 5 ml of nutrient B solution with 1 litter of R.O water. The quantity of NS may vary in different step of plant growth. For example, After seedling when a cotyledon appeared I have used 10 ml of NS in 1 litter of R.O water.

As my plant requires light for growth, I kept it in sunlight for nearly 6 hours a day so that it gets natural light. I checked pH and ppm of water before and after adding nutrient solution.

For Reference :

Nutrient A contains :- Nitrogen, Calcium and other macro nutrients

Nutrient B contains :- Phosphorous, Potassium, Magnesium and other micro nutrients.

N.S ⟶ nutrient solution

R.O ⟶ reverse osmosis

pH ⟶ potential of hydrogen

ppm ⟶ parts per millions is a unit of measurement for concentration.

4.TABULATION

(Examine the growth of plants in different stage)

23-09-2025 to 25-09-2025

HYDROPONIC PLANT GROWTH EXPERIMENT	NUTRIENT RICH WATER lettuce seeds			NO NUTRIENT WATER lettuce seeds		
	Day	Day	Day	Day	Day	Day
Measurement	1	3	5	1	3	5
Sprout Appeared / Not	–	–	Colour changes	–	–	Colour changes

No sprout came out , No growth till 10 to 15 days.

25-09-2025 to 05-10-2025

HYDROPONIC PLANT GROWTH EXPERIMENT	NUTRIENT RICH WATER SPINACH			NO NUTRIENT RICH WATER SPINACH		
	Day	Day	Day	Day	Day	Day
Measurement	1	2	7	1	2	7
Sprout Appeared / Not	–	–	Sprout seen	–	–	Few Sprout seen

Seeds without nutrient rich water did not bring cotyledon.

HYDROPONIC PLANT GROWTH EXPERIMENT	NUTRIENT RICH WATER SPINACH			NUTRIENT RICH WATER TOMATO		
	Day	Day	Day	Day	Day	Day
Measurement	9	11	13	1	3	4
Number of leaves	Cotyledon appeared	2 leaves	4 leaves	_	_	_
Length of largest leaves (mm)	_	Very little leaves	5 mm	_	Seeds changes colour	Sprout appeared
Width of largest leaves (mm)	_	Very little leaves	3 mm	_	_	_
pH level	_	5.0	5.0	_	_	_
ppm level	_	_	_	_	_	_
Plant appearance	Fresh	Fresh	Fresh	_	_	_

HYDROPONIC PLANT GROWTH EXPERIMENT	NUTRIENT RICH WATER SPINACH			NUTRIENT RICH WATER TOMATO		
	Day	Day	Day	Day	Day	Day
Measurement	15	17	19	5	7	12
Number of leaves	Few leaves	Few leaves	Many leaves	_	_	_
Length of largest leaves (mm)	1.5 cm	2 cm	2 cm	_	_	1 cm
Width of largest leaves (mm)	0.5 cm	0.5 cm	0.8 cm	_	_	0.3 cm
Nutrient solution per liter of RO water	5 ml	5 ml	5 ml	_	5 ml	5 ml
pH level	_	5.0	5.0	_	_	_
ppm level	_	_	_	_	_	_
Plant appearance	Fresh	Fresh	Fresh	_	_	_

spinach become dull after 20 days and completely dried.

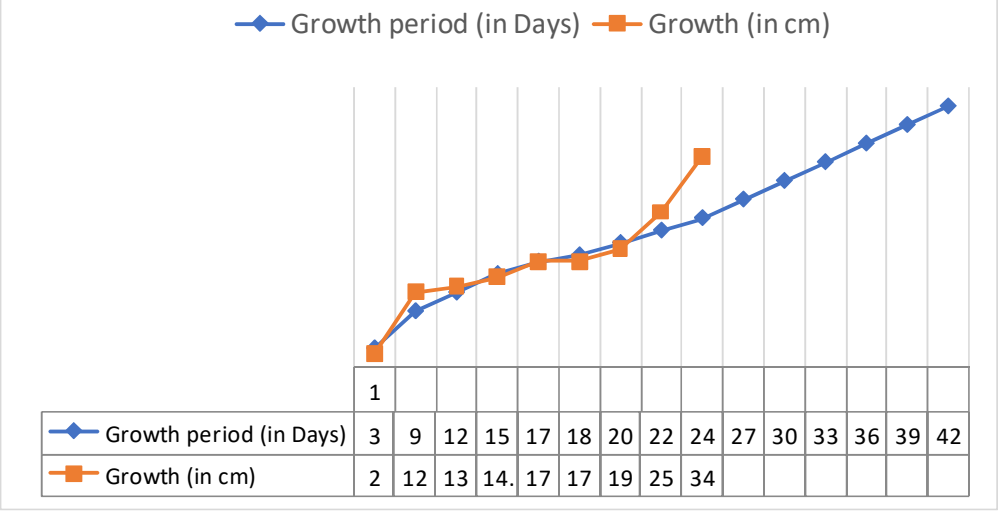
HYDROPONIC PLANT GROWTH EXPERIMENT	NUTRIENT RICH WATER TOMATO			NUTRIENT RICH WATER BITTER GOURD		
	Day	Day	Day	Day	Day	Day
Measurement taken	15	16	18	7	9	12
Height of plant	5 cm	5.5 cm	6.5 cm	Cotyledon appeared	12 cm	13 cm
Length of largest leaves (cm)	2 cm	2 cm	2.5 cm	_	3.5 cm	4 cm
Width of largest leaves (cm)	0.4 cm	0.5 cm	0.5 cm	_	2 cm	2 cm
Quantity of Diluted Nutrient solution	50 ml	60 ml	60 ml	Sprinkled	5 ml	5 ml
pH level	6.0	6.0	6.5	_	5.5	6.0
ppm level	118	137	250	_	_	_
Plant appearance	Fresh	Fresh	Fresh a green	_	Green	Green fresh

Due to rainy day there was no sunlight, due to this reason tomato plant became dull and dried on 20th day.

I understand that sun light is much needed factor in Hydroponic system of farming.

HYDROPONIC PLANT GROWTH EXPERIMENT	NUTRIENT RICH WATER BITTER GOURD					
	Day	Day	Day	Day	Day	Day
Measurement taken	13	15	17	20	22	24
Height of plant	14 cm	14.5 cm	17 cm	19 cm	25 cm	34 cm
Length of largest leaves (cm)	2.5 cm	3 cm	3.5 cm	4.5 cm	4.5 cm	4.5 cm
Width of largest leaves (cm)	4 cm	5 cm	5.5 cm	6.5 cm	6.5 cm	6.5 cm
Quantity of Diluted Nutrient solution	10 ml	65 ml	120 ml	180 ml	270 ml	180 ml
pH level	5.5	5.5	6.0	6.0	6.0	6.0
ppm level	_	280	440	407	337	583
Plant appearance	Green	Green	Green	Green	Growing gradually	Climbers are growing

GRAPHICAL REPRESENTAION OF PLANT GROWTH




5th day of spinach


15th day of Spinach


4th day of
tomato seeds


15th day of tomato seed
plants growing


22nd day of tomato seeds
plants growing up

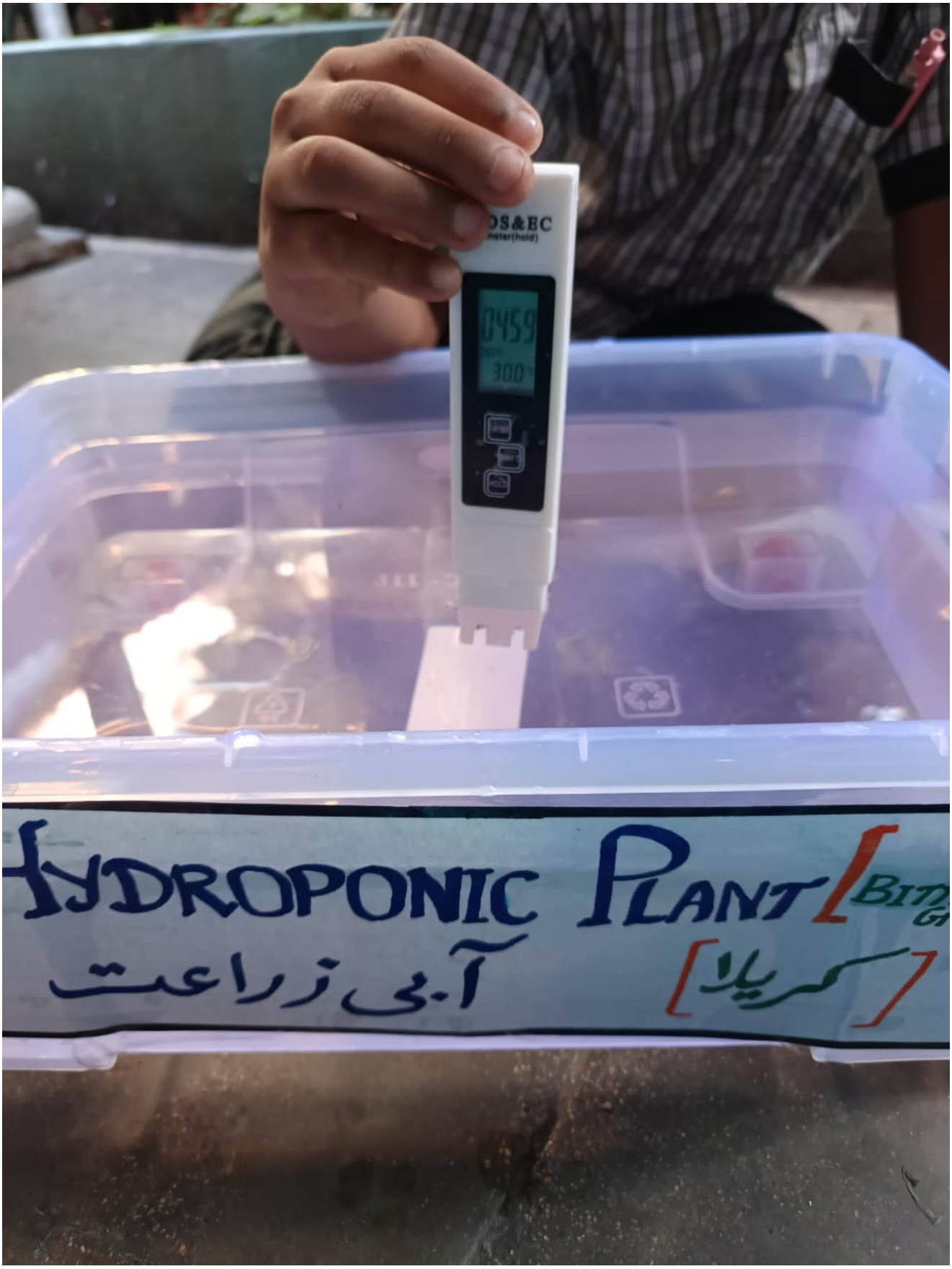

HYDROPONIC PLANT [TOMATO]
آبی زراعت [ٹماٹر]


7th day of bitter gourd plant growing


9th day of bitter gourd
BITTER GOURD
HYDROPONIC PLANT


15th day of bitter
gourd plant growth


22 nd day of bitter gourd
plant growth


DS&EC
HYDROPONIC PLANT
آبی زراعت


HYDROPONIC PLANT
آبی زراعت
کریلا


Homemade fertilizer plant growth


24 day of nutrients water
plant growth

Result and Discussion

The Seeds which I used for hydroponic system needed different climatic conditions and nutrient, as well in different stages of its growth.

- Lettuce needed low temperature atmosphere as the temperature did not suit it, it didn't grow.
- Spinash needed different nutrient at some point of growth.
- Tomato plants growth was good, it was getting it's nutrient and sunlight it required in the apt condition. Due to rainy days, it did not get sunlight and became dull and didn't regrow after two days.
- Bitter gourd responded very well in hydroponic system of growing, and it is getting nutrients which are suitable for its growth and also receiving good amount of sunlight.
- I have two plants of bitter gourd. For plant 1 I am using nutrient readily available in the market. For plan 2 I am using decompose fertilizer, which is homemade. And I noted that both plants are responding well and growing gradually and it is appearing its flowering stage.

Conclusion

My hypothesis "Plants grow faster and better in nutrient-rich water" has been proved.

This is because of the good R.O water, which has pH level between 5.0 to 6.0 with added nutrients and sunlight.

Application

Advantage of hydroponic system of farming :-

- No need of soil for plant growth.
- Consumes very less amount of water. There by we can save 80% to 90% of water compared to soil based plants.
- Can grow leafy greens, vegetables, fruits needed for kitchen at home in short period as hydroponic plants grow faster.
- We can have these plants in balcony, Malls. Terrace of IT companies, Industries as it occupy very less space.
- Unlike other plants, hydroponic plants need no pesticides.

Future enhancement

- I will continue growing different types of hydroponic plants by using natural Fertilizers made at home.
- I wish to continue my project by keeping hydroponic plans at home and schools.
- If possible, I will advise other to grow hydroponic plants whenever it is possible.

References

pmc.ncbi.nih.gov

BIO INFORMATION

www.sciencebuddies.org

nal.usda.gov

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