

A PROJECT REPORT ON

**MODIFIED AQUAPONICS SYSTEM-A MODEL**

SUBMITTED FOR

JIGNASA - STUDENT STUDY PROJECT

**BY**

BSC (Life Science) students

**Supervisor**

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GDC, Koratla  
Dist: Jagtial

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S.Pranitha - I Yr  
G.Maneesha - I Yr  
Anjum Begum -III Yr  
P.Ruchitha - III Yr  
G.Ruchitha- III Yr

**Supervisor**

G.Neeraja , Asst.Prof. of Zoology , GDC, Koratla

## CERTIFICATE

This is to certify that the work entitled “MODIFIED AQUAPONICS SYSTEM-A MODEL” is submitted as a part of Jignasa –student study project. This work is based on the results of investigations carried out by students in the Department of Zoology , GDC, Koratla under my guidance and supervision .

(G.NEERAJA)

SUPERVISOR

## DECLARATION

We declare that the work presented in this project work entitled “MODIFIED AQUAPONICS SYSTEM - A MODEL” is entirely original and has been carried out by us in the Department of Zoology, GDC, Koratla.

### **BSC(Life Science) Students**

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## **ACKNOWLEDGEMENTS**

We feel great pleasure to express our deep sense of gratitude to our project supervisor Kum.G.Neeraja, Asst. Prof. of Zoology , Department of Zoology, GDC Koratla, under whose supervision and guidance this work has been carried out .We are thankful to principal Dr.Neeli Vasavi for extending her kind co-operation in presenting this work.

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### **Need for the study**

Fertilizers which are used in the crop fields to enhance production, are directly washed into the water body causing their eutrophication. Intensive aquacultural practices cause the same effect on water bodies. So, if both the systems are integrated an efficient utilization of nutrients and water can be done. This reduces pollution, sand erosion, optimal utilisation of water. The existing aquaculture system needs the use of water pump and a bell siphon. The project aims to create a model which is cost effective and uses material which are easily available.

### **Introduction.**

Today we are living in a world of food shortage and pollution. The current world population of 7.3 billion is projected to reach 9.7 billion by 2050, United Nations population division report (2015 revision). Food is a substance consumed to provide nutritional support for the body. From the remote past food acquisition methods involved hunting, gathering and agriculture. As the share of agriculture was more in food acquisition process many techniques were used to increase food production. Along with that intensification of aquaculture has led to abundant production. But, on the other side of the coin these revolutionary techniques have led to some ecological problems viz., soil erosion, lowering of underground water table, soil, water and air pollution. At this juncture aquaponics holds a hope for the betterment of our ecosystem. Aquaponics system combines intensive aquaculture with hydroponics. The nutrient rich effluents from the aquaculture component are circulated through the hydroponic component where a proportion of these nutrients are taken up by the plants before the water is returned to the fish tanks. This system combines vegetable and fish production enabling us to use land, water and nutrients efficiently. It holds a good promise where there is scarcity of water, soil and where there is strong demand for vegetables and fish.

### **Review of literature**

Aquaponics is the integration of intensive recirculated aquaculture in tanks with hydroponic production of vegetables in a symbiotic environment. In this aquatic ecosystem leads to sustainable food production. Hydroponics appears for the first time in scientific literature in 17<sup>th</sup> century (Weir et al., 1991).

Hydroponics is a Greek word meaning “growing plants within a liquid medium”. It acts as a Bio-integrated model for sustainable food production (Diver 2006). Floating agriculture was practiced in Kashmir (Simoons, 1990) and Micronesia (Manner, H.I., 1994). Nutrient solutions like fertilizers

are added to the system so that any plant can be grown. Occasionally as rooting medium perlite, gravel, clay etc are used , Diver and Rinehart( 2010).

Aquaculture is the rearing of aquatic animals or the cultivation of aquatic plants for food. Waste products and excretory products from fish gets built up in the fish pond and become toxic. With intensive aquaculture production increased but , it had high nutrients and caused ecological impacts like eutrophication. Recirculating aquaculture systems are designed to raise large quantities of fish in relatively small volumes of water by treating the water to remove toxic waste products and then reusing it. Effluent water contains metabolic by- products. Utilizing by- products from the production of primary species to grow secondary crop having economic value is called as integrated system .Plants stand as an ideal secondary crop because they utilize high levels of dissolved nutrients generated from the breakdown of fish wastes by micro organisms.

Literature on aquaponics available from 1990s mainly shows commercial and experimental DIY (do-it –yourself ) systems, Diver and Rinehart( 2010). After the work done in United states at Woods Hole Oceanographic institute (Ryther .et.al,1975) many projects were undertaken in developed and developing countries in aquaponics . In 1997 after the establishment of the Aquaponics Journal a heightened interest was created on this technique. Increased awareness of the need to cut down burden of nutrient wastes on the ecosystem as well as to increase the use of nutrients in food production system is giving impetus to aquaponics.

## **Methodology**

### **Materials required**

Plastic bottle , PVC pipe , Water level controller , Pebbles, Air pump and tubing , Fish, Mint plants



**Materials required**



## Procedure

A plastic bottle is cut at  $\frac{3}{4}$ <sup>th</sup> height from the bottom. So, it gets cut into two pieces . the larger  $\frac{3}{4}$ <sup>th</sup> part is used as base to lodge fish. Remaining  $\frac{1}{4}$ <sup>th</sup> part is flipped over and placed inside the hollow of lower part. A PVC pipe of 10 cm is taken and is inserted into the arrangement from the top. Through PVC pipe an air pipe is inserted into the larger bottle piece. A water level controller is tightly fixed in the mouth of the flipped bottle portion . On the top of the arrangement pebbles are placed which act as grow bed . This grow bed will allow bacteria to establish themselves and also support the plants . Into the grow bed mint plants are inserted .

Lower larger bottle is filled with water and fish are released into it. After placing the upper flipped portion air pump is started and water come above the PVC pipe and spill on the pebbles. Water level is maintained by holes punched in the the filter . Excess water fall through the holes in the water level controller.



Side view of the arrangement



Top view of the arrangement

## Functioning of the system:

Step 1: Water in fish tank containing ammonia from fish excrete and uneaten food is pumped into the grow bed

Step 2: In the grow bed ammonia is converted to Nitrate by Nirosonomonas bacteria

Then Nitrite is converted to Nitrate by Nitrobacter .

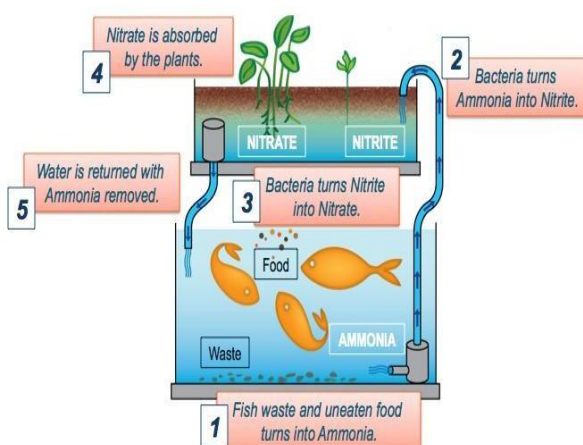
Step 3: This nitrate is readily absorbed by the plants

Step 4: Water free from ammonia is supplied back to fish tank

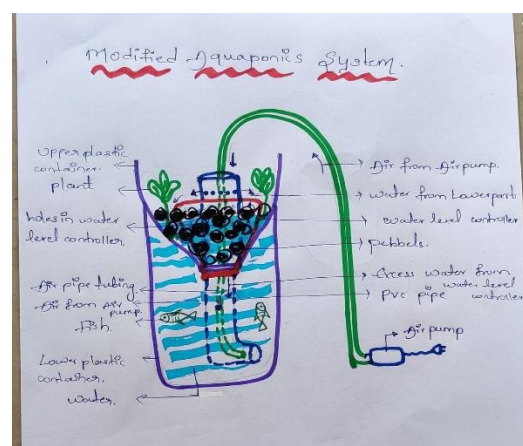
## Novelty in our model:

In the present aquaculture system a water pump is used to pump water into the grow bed and the water level is maintained in the grow bed using bell siphon. But, in our model we have integrated both the systems into one unit and replaced the water pump with an airpump which is less costly and consumes less energy. Air sent into the PVC pipe pushes water upside.

This water is pumped out through holes in the PVC pipe on top. Water level is maintained in the grow bed by the holes in water level controller. Excess water falls into the gap lower container for recirculation



**Traditional aquaponics model**



**Modified aquaponics model**

## Conclusion

Traditional aquaponis system and our modified system function on the same basis but the integrated system developed by us is unique. setup makes our system Aquaponics is a working model of an efficient nitrogen cycle . Aquaponics farming is a low input, high output method of growing high quality, healthy food. The inputs include water, oxygen, light, fish food, and power to air pump and aeration. Outputs are continual and increased volume of crop production and cleaning of ammonia in fish tank. The modified aquaponics system we developed can be extended for large scale use.

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