Planting Systems

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Chapter: Mendota FFA
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Category: Plant Science

Importance

Why is the topic important to the agriculture industry?

The topic of plant growing systems has a large effect on how we obtain the food products that are vital to our lives. The method of which we grow our food determines how much and how quickly our essential products can be produced. The scope of effective plant growing systems could potentially increase the amount of food products that are produced and reduce their costs, and allow for the production of food for nations that are lacking. Efficiency of a superior system would also lead to larger monetary gains for plant growers across the nation, and could potentially lower the costs of food products.

What problem does the investigation solve for agriculture?

The problem solved is determining which of the many plant growing systems is the most effective. We have decided to test radish growth in an Aquaponic, Hydroponic, and Conventional system. The investigation details and highlights which system produces growth the fastest, requires the least maintenance, and is the most cost efficient. After determining the results, we can then implement the system that fills these criteria best.

Other's Work

There is a variety of articles detailing information regarding every plant system used in our project. The article *Hydroponics VS Aquaponics - Which is Better?,* discusses the debates over which of these two systems is better, providing information on what each system consists of, and then compares the two. The blog post, *What is the Difference between Aqua/Hydroponics and Soil Farming?,* highlights the differences between conventional soil systems and the other two systems in a clear, concise way.

Materials and Methods

Our plan is to figure out which way of planning is the best.We will test a hydroponics, aquaponics, and the conventional way of planting. For the hydroponic we have used a cut gallon bottle, rockwool, and styrofoam. For the aquaponics we used the same size gallon, a aquarium filter, 4 freshwater fish, rockwool, and styrofoam. We will measure the growth of the plant and the water temperature. We will keep the watering of the soil and feeding of the fish constant. We will use our science notebooks to record our data.

Hypothesis/Anticipated Results

We predict that the aquaponics will be most efficient system. In aquaponics, the nutrient-rich water from raising fish provides a natural fertilizer for the plants and the plants help to purify the water for the fish. Aquaponics can be used to sustainably raise fresh fish and vegetables. We believe the fish will benefit the growth of the plant as the plants will benefit the fish.

Results

March 14 - We began our experiment, and planted seeds in each systems

March 18

Systems	**Temperature**	**Growth**
Aquaponics	78.6	- 1 seed grew, but was caught in the filter, forcing us to pull it out. - A second seed started to sprout.
Hydroponics	69.8	Budding

Conventional	75.2	Budding

March 19

Systems	**Temperature**	**Growth**
Aquaponics	78.1	Budding
Hydroponics	70.0	Budding
Conventional	72.0	One seed is starting to sprout.

March 21

Systems	**Temperature**	**Growth**
Aquaponics	78.6	Only plant growing died because of the filter
Hydroponics	69.1	2 Seeds have started to sprout in
Conventional	72.3	One seed grew to 2 3/16”

March 22

Systems	**Temperature**	**Growth**
Aquaponics	77.5	Same results
Hydroponics	74.3	⅔ seeds have now produced stems each at 1 1/16
Conventional	77.0	One seed is now at 2 4/16”

Possible reasons for improper results in our Aquaponic system could be that a plant was pulled from the aquaponic system, water is also constantly being added because of the evaporation.

March 25

Systems	**Temperature**	**Growth**
Aquaponics	77.5	Budding
Hydroponics	68.0	2 seeds have grown: 2 13/16” 1 ¾”
Conventional	70.2	2 ⅞”

March 26

Systems	**Temperature**	**Growth**
Aquaponics	78.3	1 budding
Hydroponics	69.3	2 ¾” 2 ¼”
Conventional	71.2	1 budding

March 28

Systems	**Temperature**	**Growth**
Aquaponics	78.1	2 seeds have grown both are 1/16”
Hydroponics	74.5	3 1/16”, 2”
Conventional	75.2	2 ⅞” 2 ¼” 7/16”

March 29

Systems	**Temperature**	**Growth**
Aquaponics	70.9	1/16”
Hydroponics	69.9	3 3/16”, 2 3/16”
Conventional	70.9	3” ,2 ¼” , ⅞”

April 1

Systems	**Temperature**	**T2**	**Growth**	**T2**
Aquaponics	73.8	73.8	budding	1”
Hydroponics	70.5	70.5	3 ½”, 2 ⅝”, budding	budding
Conventional	73.8	73.8	3 5/16” , 2 5/16”	1”, ¼”

April 2

Systems	**Temperature**	**T2**	**Growth**	**T2**
Aquaponics	78.1	78.1	3 ½” , 2 ¼”	¾”
Hydroponics	73.9	73.9	3 ½” , 2 ¼”	budding
Conventional	73.1	73.1	2 ¾’ , 3 ½” , 1”	¼”, ⅜”, ⅜”

April 5

Systems	Temperature	T2	Growth	T2
Aquaponics	77.7	77.7	1 ⅛" , budding	budding
Hydroponics	70.1	70.1	3", 2 ½", ⅛"	budding
Conventional	72.7	72.7	3", 1 ¼" , 2 ¾"	1", 1" ⅝"

For our Aquaponic System our trial 2 seed was caught in the filter. One fish, Donny, is slowly passing away, so we placed him in a different container.

Discussion

What do the results of the study mean?

The average temperature for the Aquaponics was 76 degrees, the lowest being 70.9, the highest being 78.6. The average temperature for our Hydroponics was 70.0, the lowest being 68.0, and the highest being 74.5 We saw growth every day in all systems except for Aquaponics because of the water filter capturing the plants. The results showed that the hydroponics have worked the best for us. We believe it is because they have shown the consistent growth. It has required the least amount of work on our behalf. All we did was plant the seed and add the fertilizer.

How are they related to what others found in the "Other's Work" section?

Other sources like *Hydroponics VS Aquaponics - Which is Better,* have stated that aquaponics are the superior system, with growth being quicker and being easier to maintain. The growth for the aquaponics system did start the quickest, but was soon after brought to an end, when the plant was caught and destroyed by the filter system we were using. The hydroponics system was the most efficient and consistent in terms of growth, in contrast to the article. Hydroponics was

also the easiest to maintain, only ever having to pour phosphorus and nitrogen occasionally, while the Aquaponics system on the other hand, required that we fed the fish, refilled it with water because a heater caused evaporation, and also had to prevent the fish from getting caught between the floating rockwool that contained the seeds. The soil system required daily watering. Our experience differed from what the article stated, with the aquaponics being the most maintenance heavy system, and hydroponics being the easiest.

Conclusions

In conclusion nothing really needs to be changed. You should continue to follow the daily routine which consists of, checking the plants growth, temperature of each system, and keep maintenance on them. The continue the research continue checking the the plants growth, temperature, watering, feeding the fish, and also writing down any new changes you see that have occurred. To be more specific, for the aquaponics system you will need feed the fish daily, check the temperature everyday, and make sure that the fish do not develop any kind of disease that will affect the plants. For the hydroponics make sure that you check the temperature, the growth of the plant, and add phosphorus and nitrogen when needed. Lastly, for the traditional soil system make sure to water the plants when needed, check the growth of the plants, and the temperature.

Summary

We chose to do this study because we were interested in seeing which planting system would be best way of planting. We had found it interesting that plants can grow in just water and also with living organisms in their environment. We also wanted to challenge ourselves to an experiment

that required a little more than the other experiments being conducted in our classroom. Rather than doing the same project as another group we decided to conduct something new to us and different from the other students.

This study is important to agriculture in the way that we are trying to figure out which planting system is most effective in plant growth. We conducted this study by having three gallon containers which contain either a aquaponic, hydroponic, and a conventional system. We kept our watering and feeding times consistent to make sure we get the best possible outcomes. To keep track of how well each system was going we measured the growth of our plants everyday and took note in our notebooks. We have found that conventional is the most effective since it had all seeds sprouting. Nevertheless, we have taken into consideration that the other two systems are fairly difficult to maintain and that they might work better in a bigger environment.

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