The Effects of Nutrients on Basil Plant Growth

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2017

I. Introduction

The process of hydroponically germinating basil seeds now led up to the self-maintaining of an aquatic ecosystem model (AEM). An aquatic ecosystem model requires certain principal components in order to stabilize an ecosystem. For example, abiotic and biotic elements is what constructs the AEM.

The nitrogen cycle is a big part in the growth of plants. Nitrogen itself is crucial to the survival of plants. It's necessary for the process of photosynthesis because it gives the leaves its color. Also, the nitrogen cycle is what produces building blocks like amino acids. Amino acids are the building blocks of proteins. Without proteins, plants will not grow and develop, but eventually die. As a result of the process of the nitrification cycle, nitrites and nitrates are created as ammonia increases. Nitrites and nitrates increase in level while ammonia is reduced. Because nitrates are nutrients they contribute to the growth of the plant.

Testing nitrite and nitrate levels are important to support the growth of the basil plants in the AEM. The amount of nitrites and nitrates are the factors that helps with the growth of the basil plants.

II. Background Information

Nitrogen is a very vital element needed for plant growth and development. It helps with chlorophyll, basically the process of photosynthesis. Ammonia was added to our AEMs to create the process of nitrification. Nitrifying bacteria derives the energy from ammonia and nitrites. Ammonia, nitrites, and nitrates all relate to each other and this is because nitrites is a compound formed by nitrifying bacteria from ammonia. The nitrates are a compound that is produced by nitrifying bacteria from nitrites. We test the water level for the many different parameters. Nitrates help create amino acids, which then make proteins.

III. Hypothesis

If general hydroponics (added nutrients) is not added to the AEM, both plants will flourish in height and color. Although more added nutrients will cause the electricity to travel faster through the solution and cause growth, the ecosystem can fully sustain itself with its own self-made nitrite and nitrate. With high levels of nitrates/nitrites and the presence of nitrogen is going to make the plants have their green color and grow. Comparing ammonia levels and nitrates/nitrite are going to give the sense of data on how it impacts the growth.

IV. Materials

Item	**Quantity**	**Function**
AEM	1	To act as an ecosystem for the basil plants and organisms
Ammonia Chemical	**.**1080g	To create a jump start on the process of the nitrification cycle
Digital Balance	1	To measure correctly the ammonia chemical
5-Way Nutrient Strips	How many is required for an accurate and reliable reading	To test for nutrients like nitrates and nitrites
Ammonia Strips	How many is required for an accurate and reliable reading	To have an accurate reading on the ammonia levels in the water
Nitrifying Bacteria	5 ml	To reduce the ammonia levels and create nitrates and nitrites
Ruler	1	To measure plant growth
Date Sheet	1	To record and keep track of the nutrient levels
Basil Plants	2	Plants are needed to test the growth based on the nitrates and nitrites levels.

V. Procedures

The Jump Start

1. Measure .1080g of NH_3CI (Ammonia Chloride) on the digital balance.
2. Add to the AEM and mix well with the skewer.
3. Measure 5-way and Ammonia test strip.
4. Check nutrient levels and record them on log.

Reducing Ammonia and Creating Nitrites and Nitrates

1. Test the ammonia level beforehand and bring out the digital balance.
2. Measure 5 ml of nitrifying bacteria on the balance.
3. Add the bacteria into the AEM and mix with the skewer.

Adding the Plants

1. Due to the nitrifying bacteria added in the other section, the ammonia level should have gone down.
2. Test the ammonia level and if the level is at 3 ppm or below, add two basil plants into the holes.
3. Use the 5-way test strips to record the levels of the nitrates and nitrites.

Measuring the Growth

1. Keep recording the levels of the ammonia, nitrates, and nitrites as days go by.
2. Measure the growth of the plants in centimeters and log in the data.
3. Log in more data as days go by.

With Added Hydroponics

1. Once you've collected enough data for the time period of where no nutrients were added, add the general hydroponics to the AEM tank.

2. Measure the electrical conductivity (EC) with a Hanna combo meter, it should go up to a range between a us/cubic centimeters of 1400-1600 (initial growth for leafy plants).
3. Check pH levels and record data.

VI. Results

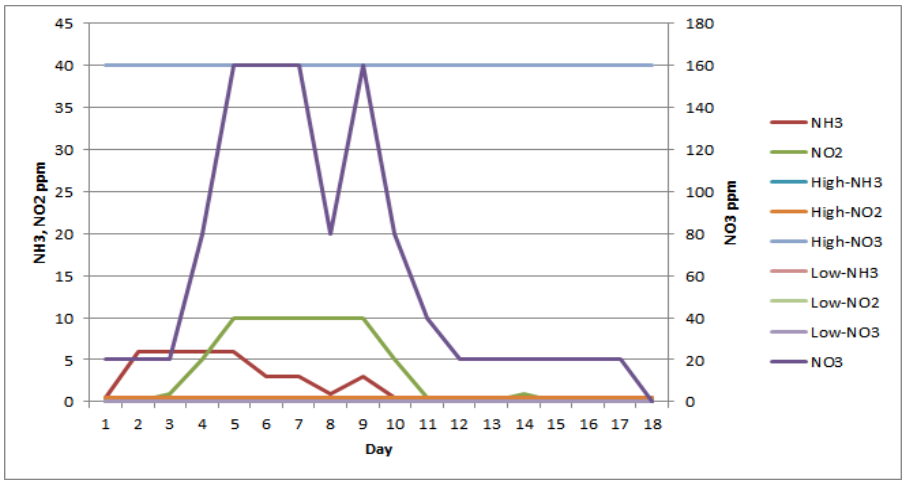

Figure 1. This graph represents the amounts/levels of NH3, NO2, and NO3.

Nitrate levels are high and this shows that the plants are receiving nutrients. The results collected show that the nitrate levels have not been exceeded and the basil plants are getting the certain amount of nitrates they need in order to flourish.

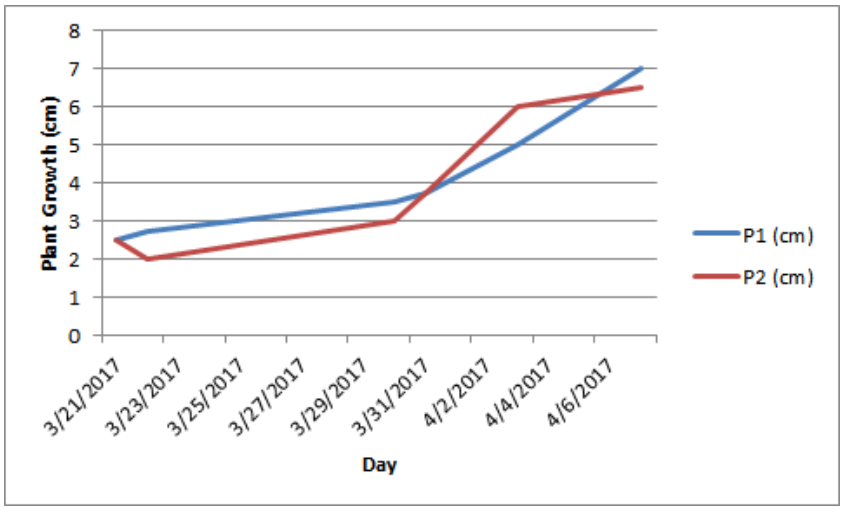

Figure 2. This graph shows the height of the plants beginning from March 21 to April 6 of 2017.

Comparing this graph to figure 2, the nutrients are giving the plants growth. Their height is increasing daily.

VII. Analysis

Based on the results, the AEM is healthy and will probably remain healthy. On figure 1, it shows that the ammonia level exceeds its danger level. Having the ammonia at 6ppm is very dangerous for the plants and organisms. When the nitrifying bacteria was added, it created nitrites, which use the ammonia as food. On the graph, it shows that once the ammonia is eaten and is reducing due to nitrites, the nitrites then make nitrates. Both nitrites and nitrates on the graph flourish while the ammonia decreases. This helps the plants have the right level of ammonia in order for them to grow and develop. Keep in mind that no nutrients are added. Plant 1 grew 17 centimeters and plant 2 grew 16.5 centimeters between the time frame of a month and a week. No nutrients were added to the AEM in the first month. Its initial growth was 2.5 centimeters and on April 19, plant 1 was at 12.5 cm and plant 2 was at 13cm. However, for the last week, general hydroponics were added. On April 20, nutrients were then added to test if the plants would grow quicker since more protein were placed inside the AEM. When nutrients were added, they measured up to 12.5 cm and plant 2 was 13 cm. There were 10 leaves on both plants before nutrients were added. On April 24, the plant 1 grew up to 17 cm and plant 2 grew up to 16.5 cm. There was a total of 11 leaves on plant 1 and 12 leaves on plant 2.

VIII. Conclusion

A very important factor in living things is the necessity of nitrogen. Living things and their environment undergo the process of nitrification. Nitrites and nitrates are going to help the plants grow and develop since they are used as nutrients. However, general hydroponics are also nutrients which can be added in an ecosystem. Based on the results, they can strongly impact

with the growth and color of both basil plants. The hypothesis was supported because before April 20 when nutrients were not added, the AEM could maintain and self-produce the right amounts of nitrite and nitrate. It can sustain itself into a healthy environment. However, with added general hydroponics, there was a large change of growth within a period of 5 days. Added nutrients supported the basil plants greatly and it was just used as a boost for growth. There were limitations in the data collected. At fault, the data collected for the time period where no nutrients were added was longer than the data collected for the time period where nutrients were added. Next steps are to collect the same amount of data for both components: data without nutrients and date with nutrients. This will lead to reliable results.

Bibliography

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