|  |  |  |
| --- | --- | --- |
|  |  | |
| [Journal](http://docs.google.com/journal.html) | **Conclusion:**  In this experiment, the data shows evidence to support my prediction that if nutrients in the soil influence the rate at which regenerated plants grow then soil with a high Nitrogen content will show the highest positive change in growth because Nitrogen is necessary for the building of proteins and nucleic acids. In soil, Nitrogen is the most limiting nutrient. Most of the Nitrogen in the soil is not found in the form plants need it in. Nitrogen in the soil is commonly found in NH3, ammonia, or NO2, nitrites, but not in NO3 which are the nitrates plants need. Without a sufficient source of Nitrogen, plants are not able to synthesize proteins at a fast enough rate.  In my first attempt at this experiment, all of the plants started out growing. However, due to the hot weather in the green house, the plants did not stay alive for long. Spider plants are meant to be kept moist at all times. The soil should never be allowed to dry out (Heitz 151). Since it was so hot in the greenhouse and because water was easily draining out of the Vermiculite, the plants dried out. Even with daily watering, the soil became firm and dry. The cracked leaves were evidence that it was too warm of a location with too much sunlight (Heitz 151). The plants with the supplements Phosphorous and Potassium seemed to dry out the most. The soil was very hard and clumped together. Pictures 3, 4, 5, and 6 of the firt attempt illustrate the dying plants from the high temperature and lack of sufficient water. The leaves became brown and dried out and easily broke off from the plant. It was difficult to gather any solid data from this but it began to show that even under these undesirable conditions, the plants containing Nitrogen looked the best and stayed the greenest (see first attempt pictures 1 &2). In order to combat this problem in the next attempt at this experiment, I placed the plants in tubs to catch the drained water and allow the plants to stay moist at all times. We still gave them the same amount of water, 150ml.  In the second attempt at the experiment, the adjustment helped considerably. The tubs sufficiently kept the plants moist but not overly damp. All of the plants began to grow at the beginning stages of the experiment. However, as the experiment went on, the plants containing Potassium and Phosphorus began the get brown and yellow. These symptoms are a sign that they are not getting enough Nitrogen. When plants do not have a sufficient amount of Nitrogen, the foliage is light green to chloratic. A plant becomes chloratic when a nutrient deficiency causes the loss of chlorophyll, which in turn causes a yellowing of the leaves. This can be seen in the close up pictures of leaves on Plants 3 and 4. Plants without enough Nitrogen are also small with narrow leaves. This can be seen on Plant 7 where the leaves are folding in toward themselves and thus narrowing the leaves. Nitrogen is essential to these plants so they are showing signs of deficiency. This is mainly because "Nitrogen is an essential ingredient in protein so protein synthesis is slowed down and carbohydrates accumulate in the plant" (Glime, 102).  Plants in my experiment also showed a deficiency of Phosphorous. In plants that are lacking Phosphorous, no high-energy compounds are being produced. Respiration, photosynthesis, and other reactions are slowed down considerably. The primary sign of the lack of Phosphorous is the synthesis of blue, red or purple anthocyanins. This coloring is found in the vacuoles where sugar accumulates in older leaves. This can be seen in the picture of a leaf in both Plant 3 and Plant 4. Phosphorous is needed in cell division so without it, growth in the plant stops (Glime, 102).  The Potassium deficiency I see in these plants is most commonly dead spots of leaf margins. The middle bend in the leaves of Spider Plants was the most common place for this to occur. For example, the close up picture of a leaf on Plant 7, Plant 3 and Plant 4 shows the brown, dead spots on the inner crease of the leaves. Not enough Potassium also causes chlorosis of the leaves like was shown in the nitrogen deficient plants (Glime, 101). Pictures of Plant 1�s leaf show a yellowing of the leaves.  By comparing the beginning and ending pictures of the plants, I see that the Nitrogen plants look the best. They have stayed the greenest and held their shape the most. However, by looking at my collected data, I can not conclude with very much confidence that Nitrogen is the most needed nutrient. The graphs for Plants 1 and 2 show an overall positive growth rate but not a very high one. The majority of the leaves grew, however, they did not grow very much and some even got smaller. Also, when looking at the overall change, the Nitrogen plants show more negative leaves than Potassium or Phosphorous. In addition, the average growth per leaf was low comparatively. Overall, the length of the Potassium plants stayed relatively consistent. They grew some and decreased some but remained about the same length. However, by looking at the picture of these plants before and after it is obvious that they are dying. The reason they did not change is mainly because they were gradually dying and wilting. The Phosphorous plants seemed to do well and grow at the beginning and then begin to dye and shrink. They became brown and wilted.  The nitrogen plant looked as though it did better than the control plant. The picture show that Plants 1 and 2 are greener and more upright than Plant 7. Plant 7 is beginning to brown, dying spots on it and Plants 1 and 2 hardly have any. As compared to Plants 3, 4, 5, and 6 the control is doing much better. Still, the single nutrient plants are considerably more brown and limp then the Control. Although the data might not show a considerably greater growth rate, in the end, the Nitrogen plants stayed looking the best and most like the day they were planted.  **Recomendation:**  The main problem in this experiment lies in the fact that each plant was given only one nutrient. Plants need a combination of these three macronutrients along with many other micronutrients to carry out all of the proper functions. I am surprised that these plants did so well considering that they did only have the one nutrient. One of the main nutrients that these plants needed was Magnesium because a plant can not make chlorophyll without it. If a plant can not make itís own food, there is know way it can stay alive. For replication of this experiment, I recommend using a combination of nutrients instead of just one per plant. This would give the plants a much better chance of staying alive. Also, a larger sample size would have made this experiment much better. Although it difficult to get numerous plants out of just one parent-plant, I suggest more than one parent-plant and a group of clones for each one. This way there is more data and better, more solid results. In addition, I would suggest starting this experiment earlier than I did. The longer data is collected the better and if conditions are not good and the plants die, there will be enough time to start over and hopefully get good data. | |
|  | |