

Plant

Nutrition.

BY XXX

PLANT NUTRITION

For plants to grow they need more than just Carbon Dioxide, water and sunlight. Although they can though can make sugar from just these three things. Plants need protein; to make protein (for its structure and enzymes) the plant needs to take in nitrates. The nitrates are used to change the sugars into protein.

An example for this, Chlorophyll is the green pigment in Chloroplasts, which absorbs sunlight for photosynthesis the Chlorophyll contains Magnesium. If the plant cannot take in Magnesium salts through its roots, it cannot make Chlorophyll to fill the chloroplasts. Without Chlorophyll, the plant will become yellow and it will be unable to photosynthesis, so it will not be able to turn Carbon Dioxide and water in to sugar.

Here are some other minerals needed by plants that are used to grow:

- Nitrogen is needed for healthy leaves and energy.
- Phosphorus for healthy roots, and potassium helps, the plant to grow flowers and fruit.

If one of these vital elements is missing, the plants will not be able to grow properly.

Aim

My aim is to investigate plant nutrients, I will measure the growth of four wheat seedlings, over the time of 5 weeks. I will also compare the results from my seedlings to the results from the rest for my group.

I am going to grow four wheat seedlings, each in a test-tube, and each test-tube will contain a different solution. I will then monitor and measure the growth (length) and complexity of the leaves and the roots.

I am doing this so I can compare the results of a wheat seedling grown in a normal culture solution, to a seedling grown in a solution that is missing a certain mineral.

Prediction/Hypothesis

Prediction/Hypothesis

I predict that all of the seedling will grow, but the seedling that is in the normal culture solution will grow the better than the rest, because it supposedly has all the minerals that a plant needs to grow. So because all the other solutions have an element(s) missing, the seedling growing in them will not be supplied with all the minerals that they need to grow properly.

Predation

The seedling in the solution with no *Magnesium* will be small and its leaves will be yellow from the bottom upwards and small, because there is no Magnesium to make chlorophyll, and without chlorophyll the plant cant photosynthesis.

The seedling in the solution with *no nitrates* will not grow very well, and will be small and yellow, with small leaves and a thin, weak stem.

The seedling in the test-tube containing *distilled water* will hardly grow at all, because the water has had all the minerals removed from it.

My Method

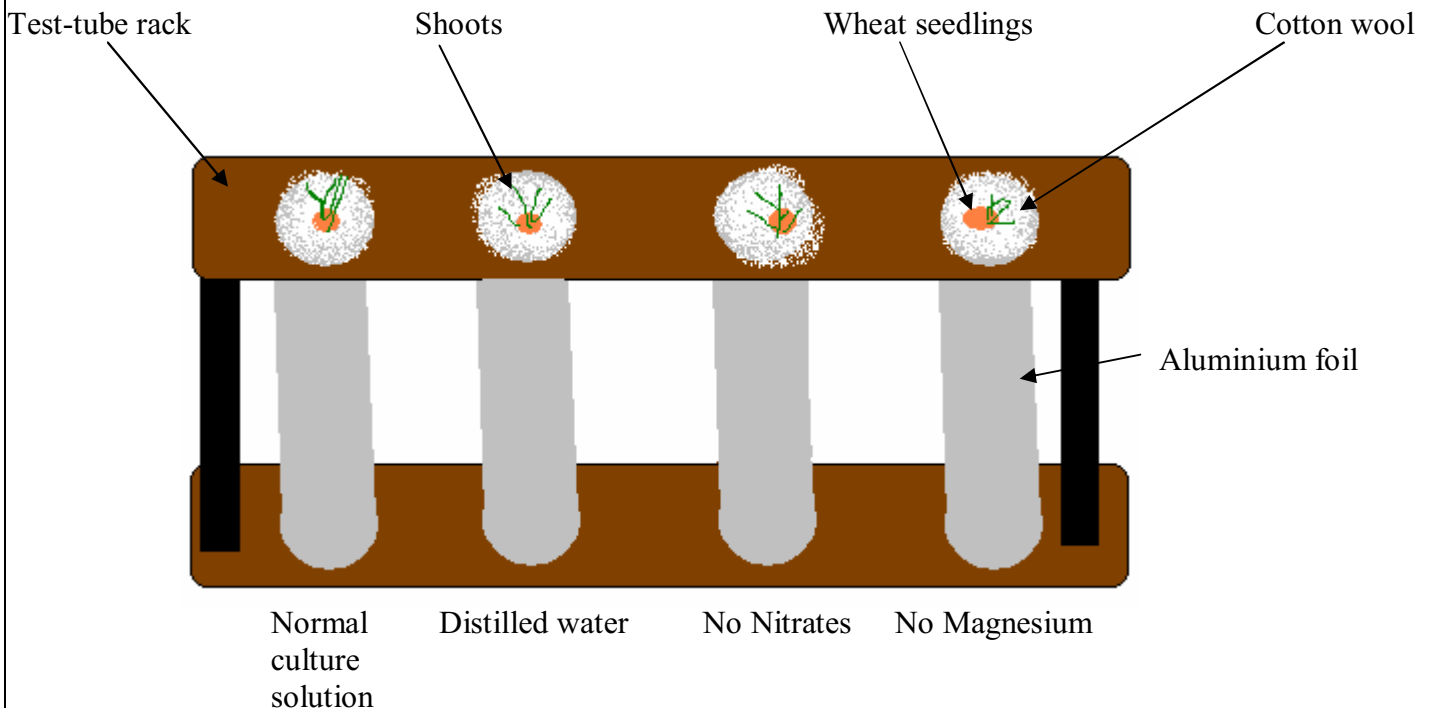
My method will be to wrap a healthy wheat seedling in a small piece of cotton wool, and then insert the cotton wool into the top of one of four test tubes, containing one of the solutions planned below:

1. Distilled water. (All minerals missing)
2. Normal culture solution (Supposedly has all the elements that a plant needs to grow.)
3. A solution that contains no Nitrates.
4. A solution that contains no Magnesium.

I will then wrap the test tubes in aluminium foil, to exclude the light, so that green algae will not be able to grow in the test-tube, so it should not impede in the experimentation.

I will then situate the four test tubes into a test-tube rack.

I will then place the rack indoors in a sunlit place, and then leave them there for 5 weeks, each week I will check on them, and measure the growth (length) and complexity of the leaves and the roots.



Results

Week 1

In week, one I put the seedlings into the test tubes.

Week 2

After the first week, all of the seedlings have grown. The shoots and roots have become larger and more complex. The seedlings have rooted and secured them selves the cotton wool, and there roots have grown down into the solutions.

S.roots				
Week No.	Roots	Stems	Shoots	Roots
2				
Group 1	8.9cm	0.9cm	4.5cm	9.6cm
Group 2	9.1cm	6.1cm	4.9cm	7.2cm
Group 3	6.0cm	6.0cm	6.5cm	8.5cm
Group 4	4.0cm	0.0cm	5.0cm	7.1cm
Group 5	6.9cm	5.3cm	3.4cm	0.5cm
Group 6	9.34cm	5.6cm	5.5cm	9.5cm
Group 7	10.5cm	10.0cm	7.0cm	8.0cm
Group 8	7.0cm	4.3cm	7.5cm	6.5cm
Group 9	8.5cm	7.6cm	7.0cm	7.4cm
Group 10	4.0cm	7.5cm	9.0cm	11.0cm
Group 11	9.5cm	5.5cm	6.0cm	10.0cm
Group 12	6.0cm	6.0cm	8.0cm	5.5cm
Group 13	8.0cm	5.2cm	1.2cm	2.3cm
Group 14	12.0cm	5.5cm	5.0cm	5.0cm
Group 15	10.0cm	4.0cm	6.5cm	3.5cm
Group 16	7.5cm	5.6cm	8.9cm	7.6cm
Group 17	3.0cm	6.0cm	6.6cm	9.0cm
Average	7.7cm	5.4cm	6.0cm	7.0cm

Roots				
Week No.	Roots	Stems	Shoots	Roots
2				
Group 1	8.5cm	2.0cm	4.5cm	5.5cm
Group 2	9.2cm	7.5cm	5.5cm	6.3cm
Group 3	11.0cm	7.5cm	7.0cm	8.5cm
Group 4	4.5cm	2.0cm	2.0cm	1.0cm
Group 5	7.3cm	4.5cm	3.2cm	2.2cm
Group 6	11.0cm	4.5cm	6.7cm	4.0cm
Group 7	11.0cm	12.0cm	12.0cm	10.0cm
Group 8	9.0cm	5.5cm	9.5cm	10.0cm
Group 9	11.0cm	7.5cm	10.0cm	9.0cm
Group 10	1.5cm	8.5cm	3.5cm	4.0cm
Group 11	6.0cm	9.0cm	7.0cm	10.0cm
Group 12	6.0cm	11.0cm	5.0cm	4.0cm
Group 13	9.5cm	4.7cm	0.0cm	0.0cm
Group 14	11.0cm	11.0cm	5.0cm	2.5cm
Group 15	3.6cm	4.5cm	2.7cm	5.0cm
Group 16	10.0cm	13.0cm	11.0cm	13.5cm
Group 17	2.0cm	9.0cm	10.0cm	5.0cm
Average	7.8	7.2	6.2	2.2

Week 3

There are no results for week 3, because we were all on Half Term.

Week 4

After the third week, mostly all of the seedlings have grown larger. The shoots and roots have become larger and more complex.

Shoots				
Week No.	Normal solution	Distilled water	Without nitrates	Without magnesium
4				
Group 1	23.5cm	13.0cm	10.5cm	29.3cm
Group 2	13.0cm	10.0cm	18.0cm	21.5cm
Group 3	20.0cm	9.0cm	14.0cm	17.2cm
Group 4	14.5cm	0.0cm	10.1cm	15.8cm
Group 5	13.0cm	6.5cm	6.8cm	10.8cm
Group 6	22.0cm	10.0cm	10.5cm	24.4cm
Group 7	23.8cm	14.5cm	10.0cm	17.7cm
Group 8	21.5cm	16.5cm	7.8cm	24.0cm
Group 9	23.0cm	20.0cm	11.0cm	26.7cm
Group 10	12.5cm	17.1cm	14.6cm	21.2cm
Group 11	19.0cm	9.4cm	6.5cm	27.0cm
Group 12	19.0cm	9.5cm	10.0cm	15.0cm
Group 13	15.0cm	16.4cm	0.0cm	0.0cm
Group 14	15.5cm	10.0cm	6.6cm	6.0cm
Group 15	19.5cm	10.5cm	8.0cm	0.0cm
Group 16	17.5cm	9.5cm	11.0cm	19.8cm
Group 17	7.0cm	7.5cm	8.5cm	14.5cm
Average	17.6cm	11.1cm	9.6cm	17.1cm
Roots				
Week No.	Normal solution	Distilled water	Without nitrates	Without magnesium
4				
Group 1	14.5cm	6.0cm	6.5cm	16.0cm
Group 2	15.5cm	13.0cm	16.0cm	16.5cm
Group 3	21.5cm	9.0cm	13.0cm	13.0cm
Group 4	7.5cm	0.0cm	7.0cm	7.0cm
Group 5	16.0cm	8.5cm	9.0cm	8.0cm
Group 6	17.0cm	6.5cm	12.0cm	17.0cm
Group 7	13.0cm	15.0cm	12.0cm	14.0cm
Group 8	24.0cm	8.0cm	14.0cm	14.0cm
Group 9	15.0cm	13.0cm	14.0cm	15.0cm
Group 10	6.0cm	6.0cm	8.0cm	10.0cm
Group 11	20.0cm	10.0cm	12.0cm	16.0cm
Group 12	14.0cm	12.0cm	15.0cm	15.5cm
Group 13	12.0cm	6.5cm	15.0cm	15.5cm
Group 14	13.5cm	12.0cm	6.5cm	4.0cm
Group 15	19.0cm	9.4cm	7.8cm	4.0cm
Group 16	13.0cm	12.2cm	10.5cm	15.0cm
Group 17	9.5cm	9.0cm	14.0cm	14.0cm
Average	14.8cm	9.2cm	11.3cm	12.6cm

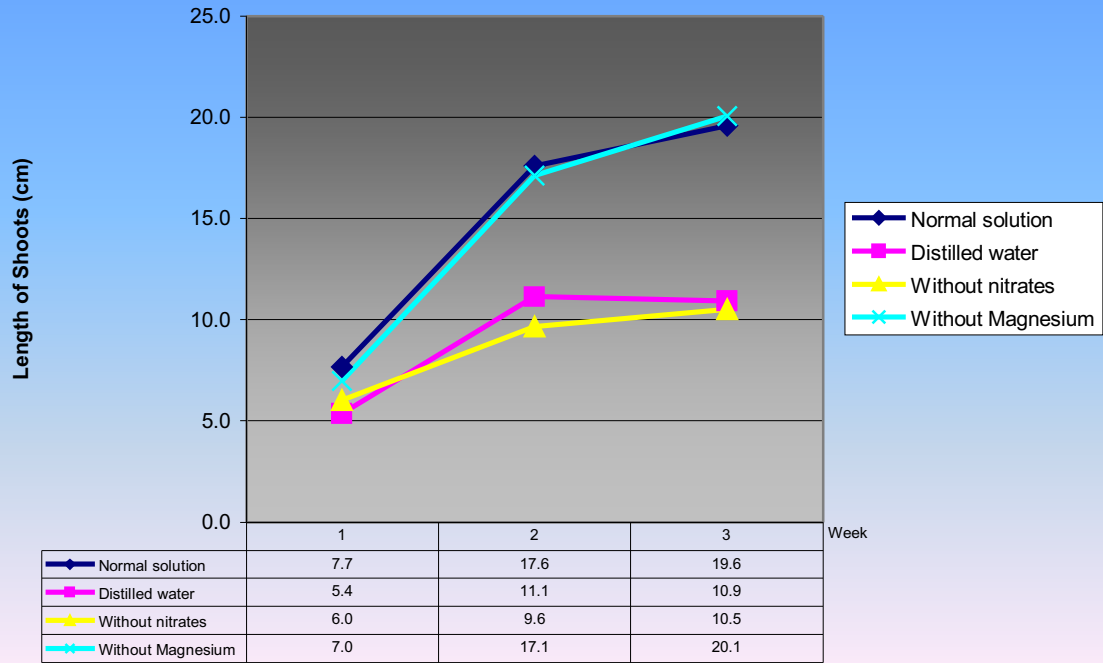
Week 5

After the fourth week mostly all of the seedlings have grown larger. The shoots and roots have become even larger and more complex.

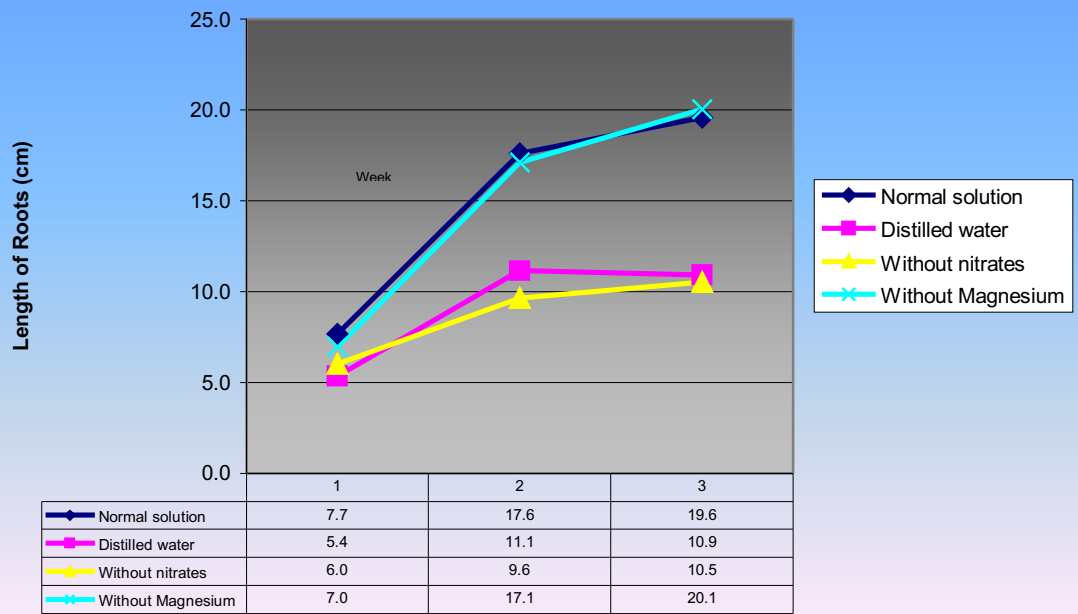
Shoots				
Week No.	Normal solution	Distilled water	Without nitrates	Without magnesium
5				
Group 1	24.9cm	13.0cm	11.0cm	30.0cm
Group 2	19.5cm	10.4cm	13.5cm	21.0cm
Group 3	20.4cm	11.0cm	14.0cm	18.9cm
Group 4	15.0cm	0.0cm	10.8cm	17.5cm
Group 5	23.5cm	8.0cm	15.0cm	11.0cm
Group 6	28.0cm	10.5cm	12.5cm	16.0cm
Group 7	26.0cm	14.8cm	10.0cm	24.0cm
Group 8	22.0cm	17.0cm	7.5cm	26.0cm
Group 9	24.0cm	20.0cm	11.5cm	27.5cm
Group 10	13.0cm	9.0cm	15.0cm	26.0cm
Group 11	25.0cm	12.0cm	8.0cm	30.0cm
Group 12	19.0cm	8.5cm	9.5cm	17.0cm
Group 13	11.7cm	14.2cm	9.5cm	17.0cm
Group 14	15.0cm	9.5cm	5.0cm	9.5cm
Group 15	18.0cm	9.4cm	6.9cm	9.5cm
Group 16	17.0cm	10.0cm	10.5cm	22.0cm
Group 17	11.0cm	8.0cm	8.5cm	18.0cm
Average	19.6cm	10.9cm	10.5cm	20.1cm

Roots				
Week No.	Normal solution	Distilled water	Without nitrates	Without magnesium
5				
Group 1	14.5cm	6.0cm	6.5cm	16.0cm
Group 2	15.5cm	13.0cm	16.0cm	16.5cm
Group 3	21.5cm	9.0cm	13.5cm	13.0cm
Group 4	7.5cm	0.0cm	7.0cm	7.0cm
Group 5	16.0cm	3.5cm	9.0cm	8.0cm
Group 6	17.0cm	6.5cm	12.0cm	17.0cm
Group 7	13.0cm	15.0cm	12.0cm	14.0cm
Group 8	24.0cm	8.0cm	14.0cm	14.0cm
Group 9	15.0cm	13.0cm	14.0cm	15.0cm
Group 10	6.0cm	6.0cm	8.0cm	10.0cm
Group 11	20.0cm	10.0cm	12.0cm	16.0cm
Group 12	14.0cm	12.0cm	15.0cm	15.5cm
Group 13	12.0cm	6.5cm	15.0cm	15.5cm
Group 14	13.5cm	12.0cm	6.5cm	4.0cm
Group 15	19.0cm	9.7cm	7.8cm	4.0cm
Group 16	13.0cm	12.2cm	10.5cm	15.0cm
Group 17	9.5cm	9.0cm	14.0cm	14.0cm
Average	14.8cm	8.9cm	14.0cm	12.6cm

Length of shoots, weeks 2, 3 & 4



Length of roots, weeks 2, 3 & 4



Analysis/Evaluation

Analysis/Evaluation

I think that my results differ from the results from other people. My prediction dose not mach my results, for all of my seedlings, for example, the wheat seedling growing in the solution with no Magnesium grew better then the seedling growing in the normal culture solution.

I have discovered that the seedlings that grew in the Distilled water and in the solution with no nitrates only grew to half the size of the seedling growing, in the normal culture solution and the solution with no Magnesium.

I have found out that the seedling growing the solution with no Nitrates is as I predicted small and yellow with small yellow wilting leaves.

The seedling growing in the distilled water has hardly grown
However, I predicted that the seedling in the solution with no Magnesium will be yellow from the bottom up but my seedling has grown very well, and is green and healthy. It has grown to be even bigger than the control seedling (normal culture solution).

I do not know why the seedling in the solution with no Magnesium grow so well, it could be because I got the solutions mixed up when I put them into the test tubes, although most of the other peoples results for the no Magnesium are the same, with the no Mag. growing very well.

So it looks like it could be because the person that made up the solutions made up the no Mag. incorrectly so that could be whey everybody's results are the same, or it could be because the seedling that we all used had same strange reaction to the no Mag. solution.

Evaluation

There is one anomalous result, the seedling growing in the solution with no Magnesium should, as most science books say 'The seedling in the solution with no *Magnesium* will be small and its leaves will be yellow from the bottom upwards and small' although my results and the rest of the class's results do not do this.

I think that my experiment did not work out that well, because of this anomalous result for the wheat seedling that was supposedly growing in the solution with no Magnesium, but it might not have been the solution with no Magnesium.

It also did not work out well because I only recorded the length of the shoots and roots once a week, and because of half-term was in the middle of when the seedlings were growing, I in total only got 3 results.

If I was to do this experiment again, I would do it more thoroughly, for example, I would plant 25 wheat seedlings in each of the four solutions and then measure the seedlings each day for 6 weeks, instead of only one seedling for each solution. This type of readings will give me a better set of results, because if there are anomalies results from one or two of the plants, they will not have a big effect on the overall result.

Bibliography

GCSE BIOLOGY book D.G. Mackean 1986