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Obtaining Evidence Coursework – Mustard Seed Germination and Photosynthesis

Photosynthesis

Equation:

Carbon dioxide + water $\xrightarrow[\text{Light}]{\text{Chlorophyll}}$ glucose + oxygen

$$CO_2 + 2H_2A + \text{light energy} \rightarrow (CH_2) + H_2O + A_2$$

The complete, balanced equation for photosynthesis in whic h water serves as the electron donor is:

$$6\,CO_2 + 12\,H\,O_2 \xrightarrow{\text{light}} C_6H_{12}O_6 + 6O_2 + 6H_2O$$

In photosynthesis, plants take carbon dioxide from the air and water from the soil, and use the energy from sunlight to convert them into food. The first food they make is glucose but that can be later changed in to other food types. Oxygen is also produced in photosynthesis and although some is used inside the plant for respiration most is not needed and is given out. The sunlight is absorbed by chlorophyll in mainly the leaves.

Aim

The experiment I did was done to learn about the effects of light source on germination and photosynthesis.

Our Experiment

We put a layer of cotton wool inside a Petri dish and used water to make the cotton damp. We then evenly place a number of seeds on it (it is important to place the seeds evenly on the cotton wool so the seeds have equal amount of space to grow in and to make it a fair test). We left these Petri dishes in three different condition concerning light for one week (in a cupboard, light from side, light from directly above) and after one week we measures the height of the

germinated shoots and recorded our results. We completed our experiment safely and with maximum care.

Observations

I believe the results and observations I obtained from my experiment are easily enough to write a conclusion. The batch in a cupboard (1) grew the tallest overall followed by the batch with light from the sides (2) followed lastly by the ones with light from directly above (3). Although the shortest batch I believe batch 3 was the healthiest followed by 2 then lastly 1. I judged this by looking at the greenness of the plant. There were a few anomalies results such as number 5 in the in a cupboard batch (8.2cm). This was quite larger compared to the other shoots in the same batch. I calculated the average of all 3 batches in the hope of eliminating flukes. I also chose to take 10 measurements for each batch so I would have a wider range of results to study and to allow me to gather a more accurate average. I have plenty of data and the exper iment was an overall success. If I had time I could repeat the whole experiment again in the same way as it was done before in order to compare my 2 sets of results. Repeating the experiment would help get rid of fluke results concerning whole batches due to occurrences such as too much water placed on cotton wool in one batch compared to another etc.

Problems

The experiment was well planed and worked well although it did have a few problems. For example the batch that was meant to be receiving light onl y from a directly above source was also receiving light from the sides of the holding trolley that the batch was positioned on. To improve the experiment we could enclose the batch with wooden (or other opaque material) walls to stop light entering. Also the batch that was meant to be receiving light from the sides only had a dark sheet of card preventing the light reaching it from any other direction. I believe this is not the best way to do this. An improvement could be an opaque box with one side open to an artificial light source or a real one if possible. The batch in direct top light and side light received differently light sources. The directly above light was created using artificial light whereas the light from the side was natural. To improve the experiment and make it a fair test all the light sources should be either natural or artificial.

Results

1	2	3
Least Healthy Tallest	2nd Healthiest Middle Height	Healthiest Shortest

1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
2.3	5.7	6.2	4.2	8.2	4.6	4.7	3.2	2.1	4.3	2.3	1.7	2.5	2.6	3.1
6	**7**	**8**	**9**	**10**	**6**	**7**	**8**	**9**	**10**	**6**	**7**	**8**	**9**	**10**
6.1	4.7	5.2	2.1	6.2	3.2	3.4	4.0	3.7	2.9	3.2	2.1	2.4	2.3	2.6

Average (cm)	Average (cm)	Average (cm)
5.09	3.61	2.48

Healthiness judged only by looks.
Height judged according to average batch height.

I believe the above results are precise and reliable. I took extreme care when measuring each shoot with a 15cm ruler. Although the results are not completely accurate I believe this is the closest I could have measured them. I pulled out the whole shoot from the cotton before measuring so that I would be able to precisely measure the whole shoot. After measuring a shoot I placed it to one side as not to mix up previously measured shoots to unmeasured ones. I think I used all equipment needed and available to me with skill and accuracy and produced the best set of results I could have.