Investigating the Rate of Photosynthesis

Aim: My aim is to prove that a plant's photosynthesis rate is affected by its limiting factors.

Plan: There are a number of limiting factors that affect the rate of photosynthesis these are; Carbon Dioxide levels, light intensity, amount of water and the amount of chlorophyll. My plan is to investigate how the amount of light affects the photosynthesis rate by increasing the distance between the light source and the plant. I have decided to use Canadian pondweed as it has a very high photosynthesis rate and will photosynthesize under water, which is crucial to our experiment; Canadian pondweed should give us the most reliable and accurate results. I will conduct this experiment using Canadian pondweed and I will vary the level of light to prove that the rate of photosynthesis is affected by the limiting factors.

Hypothesis:

$$\text{Carbon Dioxide} + \text{Water} \xrightarrow[\text{Light Energy}]{\text{Chlorophyll}} \text{Glucose} + \text{Oxygen}$$

The above equation is for photosynthesis it works like this. Photosynthesis is the process that the plant uses to produce food. The plant takes in Carbon Dioxide by diffusion into it's leaves from the air or in this case the water and the chlorophyll will turn the CO2 and water into glucose and the oxygen is given off as a by-product. In my case the Oxygen will rise through the water in bubbles which I will count for my results.

Diagram:

Method: I will obtain the pondweed and immerse it in a beaker of cold water, the water is cold as it will get heated up by the lamp and the temperature of the water dramatically affects the photosynthesis rate, too hot and the pondweed may stop photosynthesizing and likewise if the water is too cold. I will then cut the stem of the plant under water as the plant has a safety mechanism where the stem cells close up and will not allow the water up to the plant that is needed for photosynthesis. The pondweed will then be sunk to the bottom of the beaker by attaching a ball of plastercine. The other apparatus will be setup as above.

Each result is the amount of bubbles of oxygen produced by the plant in 1 minute and these values indicate the rate of photosynthesis. I will vary the amount of light by increasing the distance between the lamp and the plant by 2:5cm each time and I will collect three values for each distance so we will get a very concentrated and also a very wide ranging set of results. As I will have so many results any "duff" ones can easily be spotted and removed.

Prediction: I predict that the amount of bubbles or rate of photosynthesis will decrease as the distance between the lamp and plant increases.

Results:

Distance (cm)	Amount of bubbles 1st	Amount of bubbles 2nd	Amount of bubbles 3rd	Average amount of bubblesth
2.5	73	74	71	72
5	62	58	57	59
7.5	53	54	53	53
10	42	46	46	45
12.5	38	37	37	37
15	34	35	34	34
17.5	31	32	32	32
20	27	26	28	27
22.5	26	22	23	24
25	19	20	19	19
27.5	17	17	19	17
30	16	15	15	15

Graph: See attached sheet.

Conclusion: If you look at my results it is clear to see that the amount of bubbles decreases as the distance gets larger. This proves that the rate of

photosynthesis is greatly affected by the limiting factors in this case the light intensity.

If I did this experiment again I would take 5 or 6 values for each distance as some sets such as 22.5cm are erratic. Although the distance is directly affects the light intensity it is not certain that the light levels will go down accurately. If I did the experiment again I would use a light sensor that monitors the light intensity so the results would be more accurate.

I believe I have successfully achieved my aim and proved that the rate of photosynthesis is affected by the limiting factors.

By
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