

Photosynthesis

Aim: To investigate the way light affects the rate of photosynthesis on Elodea.

Equipment: Test tube, Test tube rack, Lamp, Ruler, Thermometer,

Other: Water, Sodium bicarbonate, pond weed.

Plan of task: A piece of pondweed will be cut and placed into a beaker containing water and sodium hydrogen carbonate. A lamp will be shined on to the pondweed and the amount of bubbles released from the plant will be counted. The lamp will be adjusted to different distances from the plant to get different results.

Light intensity is to be the variable explored in this investigation. Increasing or decreasing the distance from the light source to the plant can vary light intensity.

Light Wavelength Light energy is absorbed by pigments in the leaf such as chlorophyll.

Factors of experiment: I must use the right type of light, Blue light is easily absorbed by chlorophyll, this is the type of light which comes from sun.

The time when bubbles are counted must always be the same (Five minutes)

The water temperature must be kept at 20°C.

There must be the same amount of water in the tube each time.

Add the same amount of Sodium bicarbonate in to the pond weed and water each time. The experiment must be carried out in the space of two hours so the plants don't use up a significant percentage of oxygen.

These factors must all be kept constant otherwise each time the experiment is carried out the results will change, then the experiment would be biased.

The pond weed must stay the same.

The results would be more accurate if the factors were replaced (the same) each time.

Prediction: I predict that increasing the light intensity will increase the rate of photosynthesis because the light intensity is much greater when the light is closer to the plant I think this because in the summer when the light intensity is greater, plants and flowers grow larger and have many different fruits and colours. This I know is due to more photosynthesis taking place, therefore more chlorophyll and more oxygen produced.

Evidence: To make the results accurate I will repeat the counting of bubbles five times at each distance away from the light.

Method

1. Set up the lamp at a fixed distance away from the test tube but leaving out the pond weed, funnel, test tube, water, and the sodium hydrogen carbonate.
2. Fill the beaker with water the same each time and 1 spectacular of Sodium bicarbonate.
3. Select 1 piece of pond weed roughly 5-7cm long and cut off the stems.
4. Place the pond weed in the test tube and secure the funnel upside down over (on top of) the pond weed using the plasticine.
5. Place the pond weed in the test tube.

6. Place the ruler so that the "0" measurement is aligned with the side of the beaker. (distance measured from side of beaker to edge of light bulb)
- 7.) Place the lamp 5 cm away from the beaker.

- 8.) With the light shining on the plant, record the number of bubbles emitted in a 5 minute duration. Switch off the lamp and wait for another minute before taking another reading.(so bubbles stop/slow down)
- 9.) Take 5 readings at the current distance and move the lamp 5 cm further away from the plant.
- 10.) Repeat steps until 5 readings from at intervals of 10 cm have been taken.
- 11.) For better accuracy I will use two sets of results, my own and student A's.

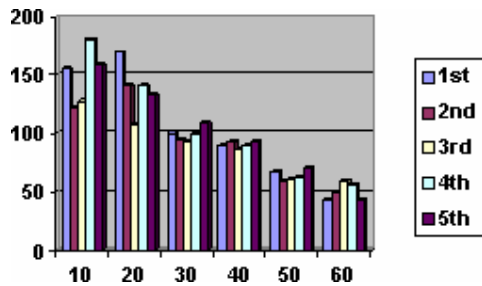
Results:

Distance from light (cm)	Number of Oxygen Bubbles in 5 minutes Repeated 5 times				
10	155	122	127	180	158
20	169	140	107	140	132
30	100	95	93	99	109
40	90	93	86	90	93
50	67	60	61	63	70
60	44	50	59	57	43

Distance from light (cm)	No. of oxygen bubbles in two minutes
5	27
10	19
15	14
20	6
25	4
30	3

The temperature of the water stayed a constant at about 20C throughout the experiment.

(Bubbles per 5 min)



Distance from light

Conclusion:

From the results and graphs that I have gathered I now know that an increase in light intensity certainly does increase the rate of photosynthesis. also, the relationship between light intensity and the rate of photosynthesis was non-linear. From one of the graphs there is a best-fit curved line. This means that the rate of photosynthesis increases at an exponential rate.

The greater the light intensity the more intense photosynthesis was, the greater the distance, the slower the rate of photosynthesis. Photosynthetic rate is being limited by certain factors such as carbon dioxide and temperature. As light intensity increases further, these factors limit the rate of photosynthesis even more until photosynthesis is completely limited and the graphed line become horizontal. This is when photosynthesis is being carried out at a constant rate.

The lamp that I used had a cover that directed the light energy somewhat. The light energy did not spread out as much as a plain light bulb with no cover. The distribution of the light energy was more concentrated, changing the gradient of the graph.

Evaluation:

Overall, I would state the experiment as a success since my predictions were supported by my results. My prediction needed to be brief, sensible and logical.

While performing the experiment, the piece of pond weed did not photosynthesize at a steady rate, even when the distance from the plant to the light source was kept a constant. This is evident because my graphs were not all exactly the same this was why it is better to carry out the experiment more than once, if this was not done the results may not go down at a steady rate.

While the number of oxygen bubbles was being recorded, the rate at which the plant was photosynthesizing had increased several times. This may be due to the poor circulation of sodium hydrogen carbonate at the beginning of the experiment. Carbon dioxide may have initially limited the rate of photosynthesis. Almost all readings were in correlation with each other. A large factor in determining data accuracy is the amount of human error during experiments. To improve the accuracy of the results, the readings would have to be taken several more times.

The classroom that we worked in was a poor site for carrying out this experiment, we were working very close to a large window and on a hot summers day, the lights were switched on, and also there were other experiments (the same) going

On in the same room this would change the concentration of oxygen and carbon-dioxide in the air.