

Aim:

Effect of light on photosynthesis.

What is photosynthesis?

Plants need and use the same light of foods as animals but while animals have to eat other things to get their food, plants make it themselves. The way they do this is called photosynthesis. The other ways that plants are different from animals, such as having leaves and root or being green, they are all linked with photosynthesis. In photosynthesis, plants take carbon dioxide from the air and water from the soil, and use the energy from the sunlight to convert them into food. The first food they make is glucose but that can later be changed into other food types. The sunlight is absorbed by the green pigment chlorophyll.

Carbon hydrates contain the elements carbon, hydrogen, and oxygen as in glucose. The carbon and oxygen could be supplied by carbon dioxide from the air. In addition, the hydrogen could come from the water in the soil. The nitrogen and sulphur needed for making protein could come from nitrates and sulphates in the soil.

This builds up of complex food molecules from simpler substances this is called synthesis. It needs enzymes and energy to make it happen. Enzymes are presented in the plants cells and the energy for the first stages in the synthesis comes from sunlight, this is called photosynthesis. And that there is a green substance and chlorophyll. Chlorophyll is in the chloroplasts of the plant cells. Chlorophyll absorbs sunlight and makes the energy from sunlight.



Where does photosynthesis occur?

Photosynthesis takes place mainly in the leaves, although it can occur in any cells that contain green chlorophyll. Leaves are adapted to make them very efficient at photosynthesis.

Leaves are broad, so as much light as possible can be absorbed. A leaf is thin, so it is easy carbon dioxide to diffuse in to each of the cells in the centre of the leaf. It also contains green chlorophyll, in the chloroplasts, which absorbs the light energy. Leaves have veins to bring up water from the roots and carry food to other parts of the plant; a leaf as well has a stalk, or petiole, that holds the leaf up so it can absorb as much sunlight as possible.

Factors that affect photosynthesis

If a plant gets more light, carbon dioxide, water or a higher temperature, then it might be able to photosynthesise at a faster rate. However, the rate of photosynthesis will eventually reach a maximum because there is not enough of one of the factors needed, one of them becomes a limiting factors.

If a factor pumps extra carbon dioxide into a greenhouse, the rate of photosynthesis might increase so the crop will grow faster. However, if the light is not bright enough to allow the plants to use the carbon dioxide as quickly as it supplied, the light intensity would be the limiting factor.

Temperature is also a limiting factor; temperature affects the enzymes that control the chemical reactions of photosynthesis.

Prediction:

I predicted that the smaller the distance between the plant and the source of light, the greater would be the rate of photosynthesis. As outlined in the introduction, light is essential for the process of photosynthesis. Therefore the closer the light source is to the plant, the greater will be the intensity of the light and so the chlorophyll within the plant will be able to photosynthesise at a faster rate.

As discussed in the introduction light is one of the limiting factors in the process of photosynthesis. The existence of light is essential for this process, as the following equation shows:



The role of light within photosynthesis is too absorbed by chlorophyll. Chlorophyll is a green pigment present in the leaves of plants, once chlorophyll has absorbed light it is able to convert carbon dioxide and water into glucose and oxygen. Therefore, the more the light that is available to the green plant, the greater will be the rate of photosynthesis and so more glucose and oxygen will be formed.

Apparatus:

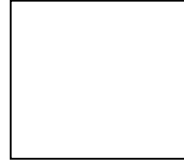
Breaker



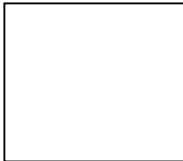
Test tube



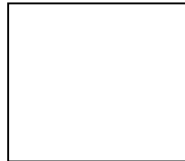
Lamp (light)



Test tube holder



Elodea (pondweed) 6 cm Water 30ml



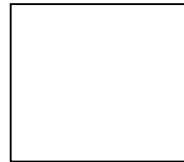
Goggles



Stopwatch



Thermometer



Ruler



Diagram:

Safety Procedure:

- Tie your scarf back
- Wear goggles
- Button up your sleeves
- Don't spill water everywhere (just in case it there might be any socket around)
- Don't touch the lamp when heated

Fair testing:

- Use the same amount of water
- Apply the same amount of time
- Same amount of plant type
- Same placement of sunlight
- Same length of plant
- Same temperature of water
- Use the same bulb in the lamp

Results:

Distance (cm)	Temperature of water (0C)	Elodea (cm)	Water (ml)	Number of bubbles (min)			Average
				2	4	6	
10	25	6	30	150	120	156	142
20	25	6	30	106	110	99	105
30	25	6	30	54	50	48	51
40	25	6	30	2	14	11	18
50	25	6	30	2	2	3	2

Conclusion:

The purpose of the experiment was to find out if light affects the rate of photosynthesis, after carrying out this experiment; I have learnt that light does affect the rate of photosynthesis. The closer the light to the plant the more bubbles were produced which means that the rate of photosynthesis increased.

I predicted that the further the light to the plant the less bubbles will be produced this is because as the intensity of light is increased more light can be trapped by chlorophyll to produce glucose and oxygen. In this experiment the oxygen produced forms bubbles were counted to determine the rate of photosynthesis. The results that I got what I expected as they agreed with my prediction.

I think overall I obtained a good set of results. My process was well planned and it was repeated so that I could take an average of the results. This made sure that I do not end up with any anomalous results.

Evaluation:

For my experiment, I had to find out whether light affects the rate of photosynthesis. From my results I obtained, I found that light does affect photosynthesis. The results that I got were the ones that I predicted. The results that I obtained were good as they were as I expected. However, there are ways in which I could have improved my results and made them more accurate. I could have improved my experiment by counting the bubbles more accurately by letting two people count instead of just one person counting.

The apparatus that I used was accurate, so I did not get any anomalous results. My range was good because I had measured every 10 cm but if I had measured it every 5 cm I would have got more accurate. I had enough results to figure out if light does affect the rate of photosynthesis. If I had wanted to, I could have obtained more results by getting closer distances e.g. every 5 cm, but I do not think it would make much of a difference to my conclusion.