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Modular Science

Photosynthesis Coursework

Photosynthesis produces energy in the form of glucose it uses water from the soil, carbon dioxide from the air, and energy from the suns light. Photosynthesis takes place in all plants that contain chlorophyll. Photosynthesis mainly takes place in the palisade mesophyll cell in the leaves of plants.
The main reaction is to produce oxygen and glucose, glucose is stored in the form of starch and does not affect osmosis, taking place in the plant. As pl ants respire both night and day this starch is often used up during the night when photosynthesis cannot take place. The uses of glucose within the plant are for active transpiration, cell division, the production of protein and the production of cellulose . In photosynthesis the raw materials are carbon dioxide and water. They react to form the same products of the reaction of oxygen and starch (glucose that has been stored). The reactions need energy and this comes from light. The green chloroplasts allow light to be used as energy and therefore both of these things are like helpers in the reaction.

$$6CO_2 + 6H_2O \longrightarrow C6H12O6 + 6C_2$$

Carbon Dioxide — Water — Glucose — Carbon

It is important that certain factors are present when the reaction is occurring. We know that these are carbon dioxide, water, light and Water, carbon dioxide and light, along with temperature, all have a particular effect on the rate of photosynthesis. In terms of carbon dioxide the levels in the atmosphere do not really alter very much, but if gardeners wish to increase the rate of photosynthesis then sometimes carbon dioxide is pumped into greenhouses. Up to a certain point as temperature goes up so does the rate of reaction. After it reaches a certain point though the enzymes involved in the reaction become denatured and stop working properly. The final factor, which contributes, is light. We decided to investigate how this affects the rate of reaction also.

Method

We need to find out how the of presence light and the intensity contributes to the rate of photosynthesis. To be able to measure the rate we need a visible sign that photosynthesis is taking place. We will use Canadian pondweed. By counting these bubbles we can tell how fast oxygen is being given off from the photosynthesis. We will place the Elodea in a beaker along with warm water and a bit of Sodium Hydrogen Carbonate (NaHCO3). If it wasn't there then another limiting factor may be the cause of the rate changing instead of just light.

By placing the beaker next to a lamp we can change the light intensity. The weed will be given a set number of minutes each time to adjust to the new level of light intensity. The rate of reaction will be in number of bubbles per minute (b.p.m).

Constant and Variable factors

The factor that will be changed is light intensity. The factors that will be kept constant are the amount of water the weed is put in, carbon dioxide levels, lamp that is used and temperature.

I think that as the light intensity is increased the rate of photosynthesis will also increase. But the light will reach a certain point where the rate will not increase any more. The chloroplasts will no longer be able to absorb any light so the rate will stay at its optimum level or even decrease. At this point light is no longer being absorbed.

The graph of results will probably look something like this:

Light is limited at this point Maximum rate of photosynthesis light is no longer limiting.

Results (Distance in cm)
1. 145 240 189 145 240 189 148 146 222
2. 130 210 127 130 210 127 125 130 183
4. 97 150 114 97 150 106 118 106 816
8. 55 60 40 14 60 45 76 94 600
16. 8 5 1 8 5 4 40 48 30

The last set of results is very anomalous and we won't be using it for our results. And here are the averages of these results.
Distance (in cm)/Number of bubbles per minute
1. 180.25
2. 148.63
4. 117.25
8. 55.5
16. 14.88

Analysis

The light intensity for the distances used will be shown in the following units:
1cm- 1000 units
2cm- 250 units
4cm- 62.5 units
8cm- 15.6 units
16cm- 3.9 units
In the first table of results there are some slightly different results according to the different experiments that were done. It does prove however that as light intensity is increased the rate of photosynthesis is increased also. This is because the more light there is available the more light the chloroplasts can absorb. They use this light in the reaction as energy; therefore the more energy there is available the faster the reaction can take place.

<u>Evaluation</u>
On the graph there wasn't a point where the rate started to level off.

Many things can explain these results, among others. We did not attempt to adjust the temperature as well as we could have done which is a limitin g factor of photosynthesis. Also the size of the pieces of Elodea were not all the same so some people may have achieved different results depending on the size of their Elodea and therefore how much surface area was available for photosynthesis to take pl ace in the palisade mesophyll cells. As the burette fills with the gas, water is displaced and the level drops. I think that overall our evidence is very reliable and that our results show what I thought they would.