Investigating photosynthesis in Canadian Pondweed

Aim

The aim of the investigation is find out what factors affect the rate of photosynthesis. Photosynthesis should not occur if one of the limiting factors is not present.

Plan

The factors affecting photosynthesis are:

Light - This will affect photosynthesis because it is one of the limiting factors. Without light photosynthesis can't take place as it is the energy source.

Temperature – This will affect photosynthesis because plants will photosynthesise at a quicker rate at different temperatures. The plant will denature at about 40' C and kill the plant.

Carbon dioxide – This will affect the rate of photosynthesis as it is one of the limiting factors, and is needed as a raw material for the reaction.

Water – This will affect photosynthesis because it is one of the limiting factors and therefore the plant cannot photosynthesise without water.

I am going to investigate if carbon dioxide affects the rate of photosynthesis.

I predict the more carbon dioxide the plant is given the quicker it will photosynthesise but this is only true to a certain point. I think this because carbon dioxide is one of the limiting factors of photosynthesis. If to much carbon dioxide is added then it will poison the plant and kill it, but if the right amount is added then it should photosynthesise at a quicker rate.

$$6\,CO + 6\,H\,O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C\,H\,O + 6\,O$$

Method

I set up the equipment as shown in the diagram below. In the first test I shall add no carbon dioxide (sodium bicarbonate) to the water, which contains Canadian pondweed. I will see how many oxygen bubbles the plant produces in one minute and record them in a table. By counting the oxygen bubbles produced by the plant I will be able to tell how fast the plant is photosynthesising as oxygen is a waste product of photosynthesis. I will do each test twice-in order to get an average. After the first test, which had no added sodium bicarbonate, I added 0.1 grams of sodium bicarbonate to each test up to 0.6 grams.

I will make sure it is a fair test by keeping the following the same for each test: I will use the same pondweed for each test. I will make sure the amount of sodium bicarbonate is measured to my best ability. I will leave the lamp the same distance away from the beaker of pondweed. I will keep the pondweed at the same temperature.

The things I will have to measure are the amount of sodium bicarbonate used for each test. I will also have to measure the temperature of the water which contains the pondweed otherwise it may affect my results because plants will photosynthesise at a quicker rate at different temperatures. I will also have to measure the distance of the lamp from the beaker. I will also have to time how long the pondweed is in the solution. I will make seven measurements from 0 to 0.6 grams of sodium bicarbonate doing each test twice.

For my experiment I will need the following equipment-

Pondweed, Beaker, Water, Lamp, Sodium bicarbonate, Glass rod, Scales and a stopwatch

Diagram

Carrying Out

In order to get the investigation right we made sure we used the equipment properly. We made sure that the carbon dioxide solution was measured out to the best accuracy if I do this properly I should get good results. We also had to make sure that the temperature of the water stayed the same during the test otherwise it may affect the results if the temperature changes. In order to get the right amount of solution I used scales to measure the sodium bicarbonate.

I did have to make changes from my original plan in order to carry out the investigation to the best standards. I found out that the sodium bicarbonate wasn't giving me very good results so I used a carbon dioxide solution, which gave me better results but not the best.

Whilst I was doing the investigation I had to consider my safety. I made sure there were no bags lying around in the area where I was doing my experiment. Otherwise I could have fell and injured myself. I also had to be careful around the lamp because if I had of been careless I could have burnt myself because of the hot filament.

In order to make accurate measurements we used scales to weigh out the sodium bicarbonate so there wasn't too much or to little carbon dioxide being added but we then changed to a solution so

we had to make sure we were adding the same amount for each test. . I also made sure that the counting of bubbles was accurate by concentrating on one part of the plant and ignoring bubbles being produced elsewhere.

Results

Graph

Conclusion

My results tell me that the more carbon dioxide the plant was given the more the plant photosynthesised however this is only true to a certain point because when we gave the plant 0.4g of carbon dioxide solution it produced 36 bubbles in a minute but when we gave it 0.5g of the carbon dioxide solution it only produced 28.5 bubbles in a minute which proves that it will

only photosynthesise quicker up to a certain point. We no that the plant was photosynthesising at a quicker rate because it was producing a lot of oxygen bubbles which is a waste product of photosynthesis. This helps to prove that my prediction was correct as I said the more carbon dioxide the plant was given the quicker the plant would photosynthesis, as carbon dioxide is one of the limiting factors of photosynthesis. Although I had 2 odd results my results are good enough to support my predictions. I had a curve of best fit but really I should have had a curve that levelled off at the end but instead it curves downwards this was probably due to the plant being poisoned because there was to much carbon dioxide present in the solution which made it denature.

Evaluation

Although I had 2 odd results my results are good enough to support my predictions. I had a curve of best fit but really I should have had a curve that levelled off at the end but instead it curves downwards. I ensured my results were accurate by making sure I counted the bubbles correctly and measured the carbon dioxide solution accurately and that the light stayed the same distance away from the plant. I think the 2 odd results were caused by bad measurement of the carbon dioxide solution or that I miss counted the bubbles. If I was to do the test again I would make sure that all my measurements were correct and also use different pondweed for each test because if the plant is poisoned it will affect the results.