How Environmental Factors Affect the Rate of Photosynthesis

Aim

In this investigation I am trying to find out the effect of environmental factors on the rate oh photosynthesis. We will do this by varying the amounts of light and sodium hydrogen carbonate the plant receives.

Research

I have found out that the concentration of carbon dioxide in the air doesn't change much from area to area, but the amount of light, water and the temperature varies from day to day and season to season in different places. On a warm summer day, light and temperature are generally well above the needed level and so carbon dioxide is limiting the amount of photosynthesis which can take place. In the morning, evening or winter the temperature and light is limiting how much the plant photosynthesises.

Plan

The light test

Set up the equipment as shown below
Start with the lamp 10cm away from the beaker
Turn it on and count how many oxygen bubbles are made during a minute
Move the lamp 10cms further away (now 20cm from beaker)
Do this until the lamp is 60cms away

Sodium hydrogen carbonate test

Set up the equipment as shown above
Put in 1g of baking powder
Count how many oxygen bubbles are seen in 1minute
Change the water and set up the experiment again
Put in 0.75g of baking powder
Count how many oxygen bubbles are seen in a minute
Repeat with 0.5, 0.25 and 0

Equipment

Equipment	Reason for use
Lamp	This will change the amount of light that the elodea receives.
500ml beaker	This will have the water, elodea, test tube and sometimes baking powder in it.
Test tube	The bubbles will be seen in this test tube, full of water.
Water	We need this because the elodea is a water plant and we can see the oxygen bubbles rising in the water.
Elodea	This is the plant that will be photosynthesising.
Funnel	This is to keep the elodea in one place and focus the oxygen bubbles so they go into the test tube.
Sodium hydrogen carbonate (baking powder)	This will be used to record how the amount of sodium hydrogen carbonate used will affect the plants rate of photosynthesis.
Scales	We will use these to measure the amounts of baking powder we are using.

Fair Test

This will be made a fair test by the fact that when doing the sodium hydrogen carbonate test the lamp will always be 5cm away, so that this won't be affecting the rate of photosynthesis as well. We will repeat the light test 2 times so that we make sure it is being done properly. We will use different people within our group to do different tasks so that it is timed and carried out accurately.

Prediction

I predict that as the lamp is moved away from the beaker less oxygen bubbles will be produced. I think this because photosynthesis

needs light to take place and if the bulb is closer the intensity of the light is greater so the plant will have more energy to photosynthesise. The light is needed because it turns carbon dioxide into glucose. I also think that as the lamp is moved away the gap between the number of bubbles produced will grow larger because when the lamp is close the amount the plant is respiring is limited by the amount of carbon dioxide in the air, therefore when closer it won't increase by much. I think that as more sodium hydrogen carbonate is added more oxygen will be produced. I think this because hydrogen is used for photosynthesis and so the plant extracts the hydrogen and uses it to produce more oxygen bubbles.

Results

Distance from lamp (cm)	Amount of Na H C added (grams)	Number of bubbles per minute-first test	Second test	Average
10	0g	39	48	43.5
20	0g	38	37	37.5
30	0g	33	29	31
40	0g	20	16	18
50	0g	15	13	14
60	0g	15	6	10.5

Distance from lamp (cm)	Amount of Na H C added (grams)	Number of bubbles per minute
5cm	1g	36
5cm	0.75g	19
5cm	0.5g	29
5cm	0.25g	13
5cm	0g	7

Graphs

See attached sheets

Conclusion

My results show that as more sodium hydrogen carbonate is added the Elodea gives off more oxygen bubbles because carbon dioxide is needed for photosynthesis. As the lamp is moved farther away less oxygen bubbles are given off because intense amounts of light are needed for the plant to photosynthesise, though at a certain point I don't think the plant would photosynthesise any more even if it

was given more light because there wouldn't be enough carbon dioxide around to let it photosynthesise.

Evaluation

If I was going to do the experiment again then I would have done the sodium hydrogen carbonate test more than once to get more accurate results. I may also use a different method to obtain the results, for example I might do it using the apparatus and set up shown below. I may also have some way of putting carbon dioxide in the air because the amount the plant is photosynthesising may be limited by not enough carbon dioxide even though there is plenty of light.