

## Biology

### **Aim of the Experiment**

The aim of this experiment is to see if changing one of the variables of photosynthesis will affect the pondweeds rate of photosynthesis.

### **Variables that can affect the rate of photosynthesis:**

#### ***Light duration***

Photosynthesis is only affected by light duration in that it only occurs during periods of light.

#### ***Light intensity***

Very high light intensities may bleach chlorophyll and so make photosynthesis impossible.

#### ***Carbon dioxide concentration***

CO<sub>2</sub> diffuses into the leaf through the stomata from the atmosphere. This is one of the main things used in photosynthesis and without it photosynthesis can't take place.

#### ***Temperature***

Many reactions within photosynthesis are controlled by enzymes and therefore temperature sensitive. Enzymes work best at 37.5° and stop working at about 47° because they start dying.

#### ***Chlorophyll concentration***

Chlorophyll is one of the main chemicals used in photosynthesis. Chlorophyll is not normally a limiting factor but it can become one if the levels are abnormally low. Iron, magnesium, nitrogen and sunlight are necessary for chlorophyll production, so if the plant is in an area where there is a little of one of these things then the plant could have a lack of chlorophyll and ∴ naturally have a lower rate of photosynthesis.

#### ***Pollution***

Low levels of ozone and sulphur dioxide can damage some plant leaves. Also some other types of pollution can affect photosynthesis.

E.g. Soot can block stomata (the pores on the underside of leaves that allow gas exchange), and prevent light from reaching the chloroplasts by coating the leaf.

### **Which variable I have picked and why**

I have decided to change the temperature of the Pondweed. I decided to change this because it is not part of the chemical reaction, but does affect it.

### **My Prediction**

I think that the pondweeds rate of photosynthesis will grow in intensity starting at the lowest temperature. I think the rate will continue to rise until it reaches its maximum efficiency, which is the average human body temperature (37.5°). After the maximum efficiency I think that the rate will start to fall and then eventually cut out at around 47°. This will happen because of the enzymes that are the main part of the photosynthesis reaction. The enzymes work best at human body temperature but if they get too hot they start to die and the reaction stops, and if they are too cold they do not have enough energy to take part in the reaction and lie dormant. This is why I think the reaction will cut out at 47° and start at around 15°

### **Method**

I tried to keep the experiment as simple as possible so that the results would be simple to analyse and see if my prediction is correct.

During the experiment the pondweed will be kept underwater. I'm going to add crystals to the water so that there is CO<sub>2</sub> for the reaction. I'm going to change the temperature by changing the temperature around the boiling tube that the pondweed is in. To record the rate of photosynthesis I am going to count the number of bubbles of oxygen gas given off by the pondweed.

1. Cut off a piece of pondweed and then place it in a boiling tube of room temperature water.
2. Add 1 spatula of                      crystals to the boiling tube.
3. Then get a conical flask, this is going to be used to change the temperature of the pondweed. Placing the boiling tube in the flask, with different temperature water in, will be how I change the pondweeds temperature.

## **Results**

<b>Temperature</b>	<b>Number of oxygen bubbles</b>
25°	7
30°	21
35°	50
40°	40

## **Analysis of the results**

From the results I can see that my prediction was mostly correct. There was little activity when the water was too cold. I thought that the rate of photosynthesis would rise gradually instead of sharply. But I was definitely correct about the maximum efficiency of the enzymes. This was found at 35°, but I don't think that it was 35°. I think this is just because of the way we had chosen our temperatures to use. But in the end I think that I was right about the enzymes and how the temperature would affect them.

## **Conclusion**

In conclusion I think that I have shown how changing the temperature of the pondweed affected its rate of photosynthesis and why. It is all down to the enzymes in the reaction. They work best at human body temperature and do not work well in extreme temperatures.

## **Evaluation**

During this experiment I think that I worked well. While taking the results I think that I could of done a lot better. We only took one set of results. I th ink that this was a mistake. I had wanted to take 3 different results but I had not done the experiment as efficiently as I could have and only had enough time for one set. If I had done it with three sets like I had wanted I could of averaged out the results and had a better look at how the plant behaves, with only taking one set of results I cannot prove that there are no anomalous results. I think that I put enough effort into my plan but I did want to write up more about my method but because I had kept it simple there was not much else to write. I think that my overall effort in this piece of work is higher than my usual. I have tried to make this a good piece of work but I don't feel that it is long enough or fully shows my understanding of the work.