Investigating Pleurococcus

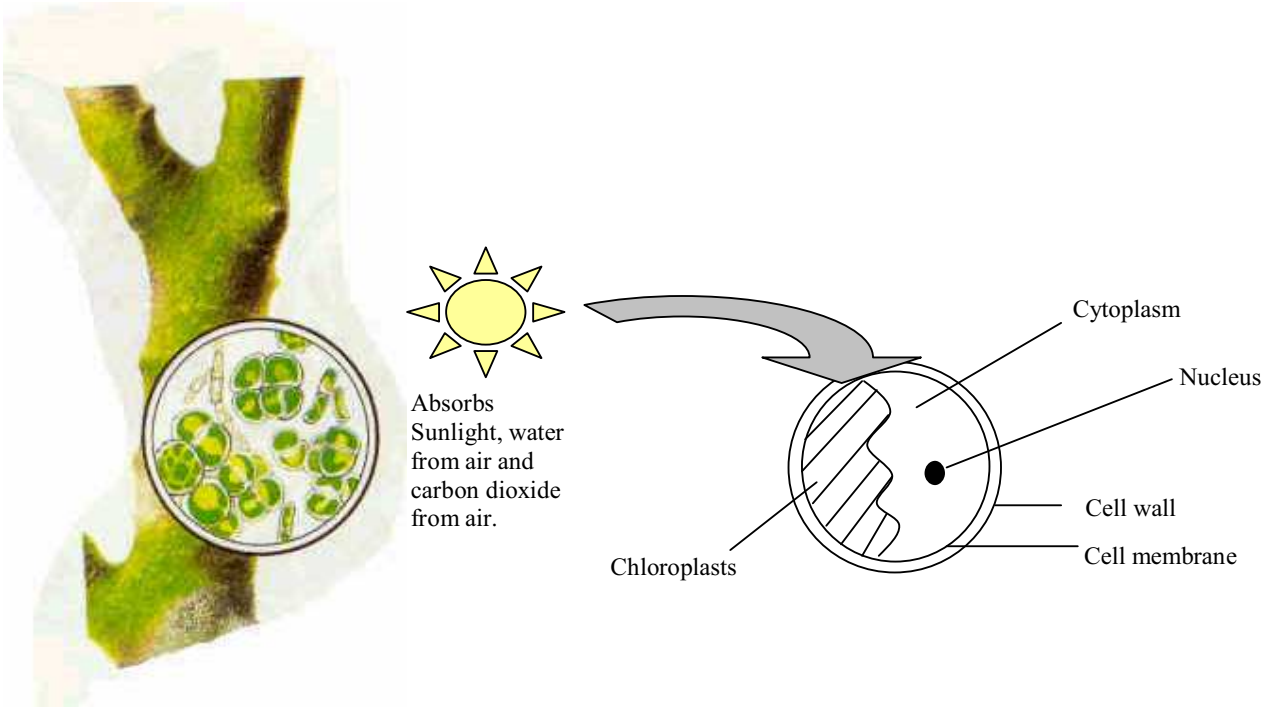
Plan

Pleurococcus is a green, single-celled algae that is found on the bark of trees, where it survives better on the north side of the tree and near the ground. It can also be found on stones and fences and usually in moist situations. As it is a green plant, as all green plants do – it photosynthesises.

The chemical reaction that is taking place is:

$$\text{Carbon Dioxide + Water} \xrightarrow[\text{Chlorophyll}]{\text{light}} \text{Glucose + Oxygen}$$

$$6CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{\text{light}} C_6H_{12}O_6 + 6O_2$$



Variables that affect Pleurococcus:

- Light: is required for photosynthesis
- Moisture/humidity: if it is too dry, the Pleurococcus will become too dry and die out, as they are green plants and require humidity/moisture to survive.
- Wind: It can transport moisture. However, it could bring about drying out and death of the algae.
- Temperature
- Amount of rainfall that runs down the tree. If it is too much, it washes off the Pleurococcus

These are called Abiotic Features.

Variables that are Biotic are:

- Position on the tree: leaves may cause dimness and branches may change the local humidity conditions.
- Animals: birds and animals may remove the Pleurococcus.
- Tree species: each tree has its own rind category, some more appropriate to the Pleurococcus than others.
- Location: the location of the tree will largely influence **abiotic factors** (e.g. shadowing effects of other trees and disclosure to the elements)
- Pleurococcus contains chlorophyll and has a single-cell. It expands rapidly in warm and damp conditions by simple **binary fission** (ways of how they actually come together/ join, like Miosis and Mitosis).

I have decided to investigate the effect of **light** upon the growth of Pleurococcus.

My hypothesis is that the side of the tree with the least light will have the most Pleurococcus, as too much light will make the Pleurococcus dry out and die, as it has no roots, and the only technique that it can obtain water, is the water that trickles down the tree through rainfall. It requires rainfall for photosynthesis, as the equation for Photosynthesis is

$$\text{Carbon Dioxide + Water} \xrightarrow[\text{Chlorophyll}]{\text{light}} \text{Glucose + Oxygen.}$$

So, the most Pleurococcus will grow on the north side because the least light is exposed to the north side of the tree, as the sun rises in the east and sets in the west, exposing the south side to the most light, leaving the north side with the least light. Therefore, the least amount of Pleurococcus will grow on the south side, as it is exposed to the most sunlight.

Method

Apparatus

- Quadrat (10 x 10 squares; altogether 100 squares)
- Compass
- Metre ruler
- Light sensor

1. Collect the apparatus above.
2. Use the compass to find out which way is North.
3. Use the metre ruler to find out how high one metre on the tree is.
4. Use the light sensor to find out how much light there is on the north side at one metre high and record the result.
5. At one metre on the north side, place the quadrat on the tree and count how many squares contain Pleurococcus, and record the result.
6. Do the same for the east, south and west side.
7. Do 1-6 for another 9 trees, leaving you with the results of ten trees.

Fair Test

To make it a fair test, I am going to make sure that I always use the same type of tree, and make sure that the equipment

we use is always the same. To test if the equipment works, we will make sure that we test it first. We will also make sure that we always measure the Pleurococcus and the Light from exactly one metre high. Also, we will make sure that the same person is measuring one metre, the same person is measuring the light, and the same person is counting the amount of Pleurococcus. We will also make sure that the range of trees we pick will always be the same. We will repeat this experiment on ten trees to make sure that the results we obtain are accurate and make it a fair test. We will also make sure that we use the same type of quadrat each time – 10 x 10 squares (100 squares altogether which will give us a percentage). This is only a sample of how much Pleurococcus there actually is on a tree.

Analysis

	Amount of Algae (%)				Amount of light (%)			
Tree Number	**North**	**East**	**South**	**West**	**North**	**East**	**South**	**West**
1	38	25	96	100	92	91.7	94	94
2	100	30	22	10	88.7	99.5	87	94
3	32	17	94	12	89	86	91	90
4	33	27	24	90	84	82	88	91
5	7	35	0	36	83.8	85.7	89.1	87.6
6	16	63	3	0	84.5	84.8	89.4	88
7	65	85	20	8	84.8	88	90.8	87.1
8	100	64	23	100	79.8	85.2	87.1	85.2
9	50	61	9	44	87	93	93	88
10	15	4	23	0	84	85.7	92	89
Average	45.6	41.1	31.4	40	85.76	88.16	90.14	89.39

I have found out that where there is the most light – on the south side, there is the least Pleurococcus. Similarly, where there is the most light, there is the least Pleurococcus. This is proved, as on tree 8 (highlighted on chart of results), there is the least light, though the most Pleurococcus, and the most light on the south, though the least Pleurococcus. This is the only tree out of the ten that has the least Pleurococcus on the south and the most Pleurococcus on the north. This gives a

fraction of 1/10. The most Pleurococcus was growing on the north side because the sun rises in the east and sets in the west, causing the south to the most exposure of the light. They do not have any roots, so the only water it can get is that, which runs down the trees during rainfall. If the Pleurococcus came into direct contact with the sunlight, some of the moisture around it might evaporate. It can also absorb carbon dioxide and water from the atmosphere.

$$6CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{\text{light}} C_6H_{12}O_6 + 6O_2$$

Therefore, I mad a hypothesis that most Pleurococcus will grow on the north side. I found out that most of the Pleurococcus did grow on the north side, hence proving my hypothesis correct.

Evaluation

From conducting the experiment, I discovered that the most Pleurococcus grew on the North side.

However, the results could have been affected because of Biotic factors, such as the trees could have been shaded because of buildings covering it. The leaves could have also done this. This could have affected the amount of light other sides received.

Another biotic factor is that some animals, like birds, could have scraped off the Pleurococcus, causing us to get inaccurate results.

The trees we experimented on could have been unsuitable for the Pleurococcus to live on, though we made sure that we chose the right trees to test on.

Some of the trees we experimented on could have been on a gradient, hence causing us to measure one metre inaccurately.

9/10 trees did not fit the trend, this could have been due to the biotic factors, such as animals scraping off the Pleurococcus, or the building shading the tree. We have no specific reason why, though we made every effort to make sure that our experiment was as fair as possible.

We estimated the amount of Pleurococcus that was on the tree with the quadrat, as counting each bit of a square would be too time consuming. However, to make this experiment accurate, we could do that, however time consuming it may be.

If we were to repeat this experiment, we would improve it by taking two different heights, and then taking an average. This is because more Pleurococcus could be higher up on the tree.

We believe, with the help of the scientific explanation of the rising and setting of the sun (rises in the east, sets in the west, leaving the south exposed to more sunlight), that we can make a reliable conclusion. This is because the evidence that we have gained proves this. Even though 9/10 trees that we measured gave odd results, we can make a reliable conclusion. The reason we got odd results, could have been because the Pleurococcus could have been affected by biotic features such as animals scraping off the Pleurococcus , or the shading and sloping of the tree.

To take our enquiry further, we could test the humidity, to check how the water in the atmosphere, could affect the growth of Pleurococcus. We could also test upon different species of trees, as some trees could provide better conditions for the Pleurococcus to grow in.