

Biology Coursework

Aim

Design an experiment to investigate if light affects the size of Ivy leaves

Plan

In this experiment I will explore how light affects the size of Ivy leaves. I will use the common Ivy called *Hedera helix*. I will take two stems of Ivy, one from the part of the garden that is exposed to lots of light, and one which exposed to little light. The Ivy leaves that are facing the south of the garden will have been exposed to high light intensities, whereas the leaves facing the North of the garden will have been exposed to low light intensities. Although the Ivy leaves are facing different directions they are still from the same soil system. I will take 15 leaves from each stem and draw around them onto squared paper. By doing this I will be able to calculate their area. I will then compare the average size of the leaves in high light intensities to the average size of the leaves in low light intensities. This should tell me if sunlight does affect the size of Ivy leaves.

Hypothesis

- **Null hypothesis:**

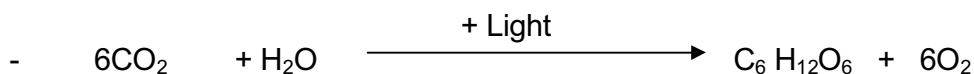
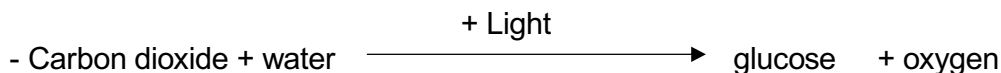
- That light intensity has no effect on the size of the leaf

- **My hypothesis:**

- The leaves are larger, because they have a higher intensity of light

I have chosen the above hypothesis, because plants cannot grow or live without photosynthesis ing.

Photosynthesis is the process of converting simple organic compounds (CO₂ and H₂O) into more complex organic compounds (glucose and oxygen), in plants:



All plants photosynthesise, they all have chloroplasts, which contain the green pigment chlorophyll. For photosynthesis to occur there must be an energy source, and this energy source is light. It is the pigment chlorophyll,

which traps the light. Photosynthesis takes place in the green parts of the plant, in particular the leaves. Since plants produce their own food via photosynthesis they are called autotrophs. Therefore, they are photoautotrophs, because their energy source is light.

In photosynthesis there are 2 main reactions that occur, the light dependent reaction and the light independent reaction. Obviously the light dependent reaction can only occur in light. The light independent reaction may not need light, but if the light dependent reaction does not occur, then the light independent reaction cannot occur, because the products of the light dependent reaction are needed in the light independent reaction.

- **Light dependent reaction:**

- this occurs in the chloroplasts
- it makes ATP from iP, this is called photophosphorylation.
- Water is split by photolysis to give H⁺ ions, which are picked up by the energy carrier NADPH
- Light is what provides the energy. Therefore, the light energy excites electrons in chlorophyll. This energy is used to generate ATP and NADPH, and photolysis makes H⁺ ions available for the light independent reaction.
- Oxygen is also released from this reaction.

- Light independent reaction:

- This occurs in the stroma
- Light is not needed to provide the energy, because the ATP produced in the light dependent reaction is what produces the energy.

Light intensity must affect the size of ivy leaves, because the rate of photosynthesis increases as the light intensity increases. So if the rate of photosynthesis increases, the size of the leaves must increase. Plus light can be a limiting factor in photosynthesis.

Another reason why I think that the ivy leaves in higher light intensities will be bigger, is because of phototropism. Most plants show this. It is when a plant grows in the direction of light, as they will turn to face the light. Therefore plants seek out light, because they need light in order to live, photosynthesise and grow.

Furthermore, the chloroplasts, which contain chlorophyll, which is needed for photosynthesis, always migrate to where the light is. It does this because the light is needed for photosynthesis, which will make the plant bigger. This is why most chloroplasts are found in the leaves. So if they are found in the leaves, most growth will occur here.

As well as this, the stomata will only open in light; this is why they close at nighttime. The stomata are needed to be open, so that the carbon dioxide can enter, which is used in the process of photosynthesis. Therefore, if they are only open in light photosynthesis can only occur in the light, so at a higher light intensity, more carbon dioxide should enter, so that more photosynthesis and growth can occur.

Lastly, in plants there is a source and a sink. The source will make the glucose, needed for photosynthesis (and therefore for growth to occur), which is stored in the sink. In most plants the source is the leaf and the sink is the flower, but in ivy plants both the source and the sink is the leaf. So the leaves must be bigger in higher light intensities, because more glucose will be made, at a faster rate, than in lower light intensities, and because the leaf is both the source and the sink, the leaves must be bigger.