Finding About Photosynthes Essay, Research Paper

Finding out about photosynthesis

Date: \_\_\_\_\_\_\_\_\_\_

Partners: \_\_\_\_\_\_\_\_\_\_\_\_

Aim: To be able to explain the conditions necessary for photosynthesis and to compare experimental results to a control. To recognise tests for some inorganic substances found in plants.

Materials:

h A plant with variegated leaves in a pot which has been in the dark for 24 hours prior to the class

h Iodine

h Alcohol

h Potassium hydroxide

h Hotplate (or Bunsen burner with tripod)

h Petri dish

h Funnel

h 2 flasks (500ml)

h 2 beakers

h Aluminium foil

h Forceps

h Retort stands and clamps

h Cottonwool

h Grolux light or other light source.

Method:

Day 1

The plant you will use has been left in the dark for 24 hours prior to the class.

1. Take one leaf of the plant and test it for the presence of starch as follows:

(a) Place the leaf in a small beaker of alcohol.

(b) Place the beaker in a water bath.

(c) Bring the water in the water bath to the boil.

(d) Leave until the alcohol in the beaker containing the leaf boils.

(e) Using forceps remove the leaf carefully form the alcohol.

(f) Wash it in the boiling water to soften it.

(g) Spread the leaf on a petri dish.

(h) Pour iodine over the whole leaf.

(i) Iodine changes to a blue-black colour in the presence of starch. Note whether this occurs.

Part A: Setting up your experiment

You will investigate the three conditions necessary for photosynthesis:

h Chlorophyll

h Light

h Carbon dioxide

You can use different leaves on one plant to test all three conditions. Use figure 2.5A as a guide to setting up the experiment.

Is chlorophyll necessary for photosynthesis?

2. (a) Select a leaf, but leave it attached to the plant. Sketch it, showing the arrangement of the green and non-green areas.

(b) Record all your sketches for this exercise in a copy of table 2.5A

( c) Remember the leaf s position on the plant so that you can locate it again later. Sketch a section of the plant to show its location.

Is light necessary for photosynthesis?

3. Select another leaf and sketch it to show the arrangement of green and non-green areas. Take a piece of aluminium foil and cover a strip of the leaf. Hold the foil in position with a paperclip.

Is carbon dioxide necessary for photosynthesis?

Carbon dioxide is present in air. One way to test if carbon dioxide is required for photosynthesis is to remove carbon dioxide from the air surrounding the plant and observe the consequences. Potassium hydroxide absorbs carbon dioxide and therefore can be used to remove the carbon dioxide from the air around the plant.

4. Use a funnel to pour potassium hydroxide into a flask so that it covers the bottom of the flask.

5. Select a small branch of the plant. Leave it on the plant. Carefully insert this branch into the flask. Do not allow the leaves to touch the potassium hydroxide solution. You may have the support the flask with a clamp and stand depending on the plant s height and shape.

6. Seal the opening of the flask with cotton wool.

7. Set up another branch in a flask as described above, but do not add the potassium hydroxide.

8. Leave the plant under the Grolux lamp or bight light for 24 hours.

Day 2 (24 hours later)

Part B: Testing for the presence of starch.

In the introduction it was mentioned that the carbohydrate produced during photosynthesis is converted to starch. The presence of starch can be used as evidence to show that photosynthesis has occurred.

9. After the plant has been in bright light for 24 hours, locate the leaf described in step 2.

10. Test the leaf for the presence of starch.

11. Draw the leaf for the presence of starch.

12. Repeat steps 10 and 11 for a leaf selected from each of the experimental procedures:

(a) covered with aluminium foil

(b) placed in a flask with potassium hydroxide

(c) placed in a flask without potassium hydroxide

Sketch your results in a copy of table 2.5A

Results:

Treatment Sketch of leaf before testing for starch Sketch of leaf after testing for starch Observation

Leaf left in the dark 24 before experiment commenced.

Leaf left in the light for 24 hours

Leaf partly covered with aluminium foil

Leaf in the flask with

potassium hydroxide

Leaf in the flask without potassium hydroxide

Discussion:

If the starch test is performed, and the iodine remains yellow this indicates that there is no starch in the leaf. After the plant had been in the dark for 24 hours there was no starch present in the leaf. The plant was left in the dark for 24 hours prior to the class so that we could test if photosynthesis would occur without the presence of light. It was also a control for the plant that was tested for starch that had been in the light for 24 hours. Starch was present after the plant was exposed to the light for 24 hours, it was found in next to one of the veins, on a dark green section.

Without light plants can not photosynthesis, they have to rely on the starch the plant may have stored on previous occasions if no light is present. Therefore plants need light to photosynthesis. Photosynthesis does not occur on all parts of the leaf, but only the parts with chlorophyll (the green sections).

The differences in colour on the leaf are caused by adaptations made by the plant. The parts of the leaf that are primarily exposed to sunlight contain much more chlorophyll and are the dark green patches. This makes the plant more efficient at photosynthesis by only placing the chlorophyll pigments where the sun s rays will reach it. For example the small plants on the ground level of the rainforest do not always get maximum sunlight coverage because the taller trees above it block out some patches. The plant adjusts to this by having its chlorophyll pigments around the edges of the leaf where the sunlight will most probably hit it. In the experiment the only parts of the leaf that contained starch were the dark green sections.

The leaf that had a strip of aluminium foil covering a small part of it proved that light is necessary for photosynthesis. If the whole leaf was covered there would have been no control to prove that light was needed. The section of the leaf that was covered showed no trace of starch, but the uncovered section had a quite large amount of starch. Thus, light is an important factor of photosynthesis.

Carbon dioxide is needed for photosynthesis, to test this we set up a leaf in a flask with Potassium hydroxide, and one without. In the flask containing potassium hydroxide there was a little trace of starch in the leaf. This might have been there beforehand, or maybe some of the potassium hydroxide leaked out of the cotton wool. For this experiment to be more accurate we could have used something more reliable than the cotton wool to keep the potassium hydroxide trapped in the flask.

The flask, which did not contain Potassium hydroxide, showed that starch was present, much more than the leaf in the flask with the solution. The more carbon dioxide in the air increases the rate of photosynthesis. Because potassium hydroxide absorbed the carbon dioxide in the flask, photosynthesis could not be achieved at its full potential because one of its input factors (carbon dioxide) was lacking or not present at all.

Each of the experiments had a control; they were the part of the plant not covered in foil, which was to see if light was required. The plant left in the dark for 24 hours was also testing to see if light was essential, and the flask with no potassium hydroxide, was to see if carbon dioxide was essential.

Conclusion:

During this practical report I have learnt that there are three main factors that must be present for photosynthesis to occur. They are Carbon dioxide, light and chlorophyll. As a result of this experiment I have discovered that if a plant is deprived of light or carbon dioxide for a period of time it begins to use up its starch deposits to make food for its self.