Biology lab report on the effects of photosynthesis essay sample

For this lab the rate of photosynthesis was analyzed upon plant leaves. A sample of a light exposed and a not-light exposed leave were used to clearly identify the role of sunlight in the process of producing and storing energy.

Aim

We are trying to find proof, to demonstrate the necessity of light and chlorophyll in the process of photosynthesis.

Background

Photosynthesis occurs in organisms which contain chlorophyll. It’s a process that involves the chloroplasts to synthesize glucose molecules from carbon dioxide and water. Energy (ATP), initially in the form of glucose (monosaccharide) is later formed by condensation reaction into starch (polysaccharide). These alpha-glucose units are attached together by glycosidic bonds. Starch is formed after the Calvin Cycle in the Stroma. Carbon dioxide is present in the air and the water is gained from precipitation or morning dew. The water is broken down in photosystem I (sourcing invisible light of 700nm) by photolysis. This process sets free electrons and helps close the cycle of the light dependent stage. But before this process can be set off, a gradient in energy must be achieved. The most energy is gained in the first part of the light dependent stage (which creates the gradient) of photosystem II, sourcing in visible light of 680nm.

There are 5 major requirements for photosynthesis to take place: 1) A temperature in the environment between 5 – 35 degree Celsius, 2) Chlorophyll available in chloroplasts, 3) Water, 4) Carbon dioxide and 5)

Light of favorable intensity. If any of these factors are absent, photosynthesis cannot occur.

Materials required

Materials list

Geranium, begonia, or impatiens plants (entirely green leaves), coleus with variegated leaves (green and white colored), hot plates and hot-water bath, Lugol’s iodine solution in dropper bottles, 250-mL beakers, 100-mL beakers, tongs, foreceps, Petri dishes, glass-marking pencil, 70% alcohol

Method

PART I – Effects Of Light And Dark On Starch Formation

The leaves used for Part I are completely green. A few of these leaves have been entirely and partially covered with black paper two days before the lab. Then the plant was exposed to good light during the day.

1. With a glass-marking pencil, label one 250-mL beaker light, and label another 250-mL beaker dark. Half-fill the two beakers with water. Place a uncovered leaf to light, and both a entirely covered and a semi-covered leaf in the dark, in the appropriately marked beakers. Place the beakers on the hot plate, bring the water to boiling, and boil the leaves 5 minutes.

2. While the leaves are boiling, use another hot plate to prepare a hot-water bath. Label one 100-mL beaker light, and one dark. Half-fill each with 70% alcohol. With forceps or tongs, remove the boiled leaves from the water and

transfer each to the appropriately marked smaller beaker. Place both 100-mL beakers in the boiling water bath. Bring the alcohol to boiling, and boil gently until all the chlorophyll in the leaves has dissolved in the alcohol.

3. While the leaves are boiling, label one Petri dish lightand another one dark. When the leaves have lost their chlorophyll, use the forceps to transfer each to the correctly marked Petri dish.

4. Gently spread out the leaves in the Petri dishes. Add drops of Lugol’s iodine solution to each leaf until iodine has come into contact with the entire leaf.

5. Wash all glassware thoroughly. Dry the table top with a paper towel

PART II – Effect Of Chlorophyll On Starch Formation

The plants used in Part II have been exposed to bright light. You will test their leaves for starch, as you did in Part I. One leaf will be all green, and the other will be partly green and partly white (variegated).

1. Repeat Steps 1 through 4 of Part I using one all-green leaf, and one green-and-white leaf. Label the beakers and Petri dishes G for the green leaf and G W for the green and white leaf.

a. Before boiling the green and white leaf, make a drawing of it, showing the distribution of chlorophyll. Label the drawing “ variegated Leaf”

b. Observe the color changes that occur when Lugol’s solution is put on the leaves.

c. After testing for starch, draw the two leaves and indicate the distribution of starch. Place the correct title under each leaf.

Data Collection and Data Analysis

Sketch 1

Sketch 2

Analysis

In Sketch 1 the light exposed leaf seemed to have produced more starch than the covered leaf. In fact the covered leaf did not show any dark purple coloring at all.

Sketch 2 show the variegated leaf, before being run through the lab procedures, green and white are clearly distinguishable. After having treated the green and the variegated leaf (sketch 2) certain areas of the variegated leaf indicated the presence of starch. The coloring took place only on the green parts, the white ones seemed unaffected.

Question & answer

1. In Part I, why did you test leaves that had been exposed to light as well as those that had been in the dark? – Those leaves in the dark were not exposed to any light, therefore also didn’t have any photosynthesis occurring. This will create a contrast towards the light exposed leaf and will help visualize the role of chlorophyll.

2. In Part II, why did you test leaves that were all green as well as leaves that were part green and part white? – Since chlorophyll comprises a leaf, we wanted to see if also some of it was present in the white zones of a leaf. This would support the assumption that chlorophyll is green.

3. From the results of Part I, what can you conclude about the relationship between exposure to light and the presence of starch in leaves? – The leaves exposed to light had photosynthesis occurring, producing glucose molecules which would be transformed into starch. Putting this into relation to the covered/darkened leaves that didn't turn dark purple after having dropped the iodine on it leads to the conclusion that starch is only formed when the leaf is exposed to light.

4. From the results of Part II, what can you conclude about the relationship between the presence of chlorophyll and the presence of starch in leaves? – The Iodine solution was dropped on both of the leaves. The green leave had dark purple dots all over it, indicating the storage of starch. The variegated leave only had dark purple coloring on the green lines, the white stripes did not indicate any starch storage.

5. Two basic assumptions of the two experiments performed in this activity are 1) that the presence of starch indicates that photosynthesis has occurred, and 2) that the absence of starch indicates that no photosynthesis has occurred. Are these assumptions scientifically valid? State why or not. – They seem to be scientifically valid, because experiments have been conducted upon the issue with resulting information to either

support or refute the hypothesis. In this case we have gathered evidence that is based on clear reasoning.

Conclusion

The evidence gained through this experiment supports the hypothesis. The Iodine helped to localize the starch and identify the factors contributing the energy storage of photosynthesis. We can now state that photosynthesis only occurs during light exposure and starch is only produced on areas where chlorophyll is present.

Some limiting factors of the lab should be mentioned though. Part I had to be repeated in order to obtain some useful results. Obviously the plants had not been exposed to sufficient sunlight over the past two days, most of the coloring of the leaves were quite minor. This in a way also helped to gain information about the process of photosynthesis. When only little light is present causing the plant to produce little starch proves that there is a direct relationship between the rate of photosynthesis and light.