

Measuring photosynthetic activity in plants



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Photosynthesis is a process in which plants obtain food by converting light energy into glucose. Photosynthesis occurs in all plants and is essential to humans because it creates an Oxygen rich atmosphere. As Frank James states, in his book *Photosynthesis in Plants* that even the modern developments are still heavily dependant on plants that undergo photosynthesis. Things such as medicine, clothes, Furniture etc all come from plants so that's why I believe, plants are key players in transforming us from the stone age to the modern 20th century and the reason why they still are used for Modern development(Frank 1)

Photosynthesis doesn't only occur in day light but, it also happens at night. As Anne Helmenstine states that in *Photosynthesis* there are two types of reaction: the reactions that require light are called light dependant reactions. In this reaction light is captured from the suns rays to make a molecules called ATP. On the other hand there are those reactions which don't require light to function these reactions are called the dark reactions(Calvin cycle). They occur at night- time and their role is to use the used ATP which was made during the light reaction and convert into glucose. (Helmenstine 4)

One way to measure Photosynthetic activity in plants is that you can measure the starch production. Darrell Vodopich states in his book *Biology Lab Manuel* that the Sugars(Glucose) which is the end product created by the photosynthesis reaction are often stored as starch. Therefore we can clearly see that the starch production found in the leaves indirectly measures photosynthetic activity in plants."(Vodopich 143)

My hypothesis based on my lab experiment on Photosynthesis : Out of the geranium leaf, variegated or purple coleus leaf; the plants kept in dark will exhibit a lesser amount of starch production then the plants which were exposed to light as a result of photosynthesis.

I used the Lugol's test for my hypothesis and test its validity the iodine test basically uses iodine to indicate the presence of starches by producing a bluish black color (Vodopich 58).

Materials and Methods

Procedure 13. 6

In this Procedure the main objective was to qualitatively observe the starch production of the Geranium leaf. We first took the Geranium leaf and dipped it in the boiling water for a minute. Then we took the same leaf and again boiled it but this time it was with methanol and we let the leaf sit for about 3-5 minutes. After that we placed the leaf onto the Petri dish and stained the leaf with iodine to reveal the indication of the starch production (Vodopich 144). The Color of the leaf was green when it was boiled with the water alone, then after the leaf changed to a pale white color stripped of its green pigment. After we stained the leaf with Iodine we saw a yellowish/white color along with purple where the veins were located.

Procedure 13. 7

In this Procedure the main objective was to find the condition of light for the photosynthesis process. In this procedure $\frac{1}{2}$ of the geranium leaf was covered completely with a foil or paper for 3-4 days before being operated

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upon in the lab. Then we placed the leaf into the boiling water and let it sit there for a minute before putting it into another boiler containing methanol for about 3-5 minutes. After that we placed the leaf onto the Petri dish and stained the leaf to show the starch production (Vodopich 146). Just like 13. 6 the color of the leaf was green when it came out of the boiling water and after wards when the leaf from removed from the boiling methanol its green pigmentation was stripped leaving a pale white color behind. Then after we stained the leaf with the iodine we saw more purple spots on the side which was exposed to light then the other darker $\frac{1}{2}$ of the leaf which contained little to no spots of purple which indicated the starches production.

Procedure 13. 8

In this procedure the main objective was the find the requirements necessary for chlorophyll for the photosynthesis process. First we had to obtain a variegated coleus leaf and a purple coleus leaf; both were kept in areas exposed to light prior to the start of the experiment, unlike procedure 13. 7. Then we extract the pigments in the leaves by first putting both the leaf in the boiling water for a minute. Then we placed the two leaves in another boiler containing methanol for about 3-5 minutes. After that we place both the leaves onto a Petri dish and we stain them with iodine. (Vodopich 146). We saw both the leaves exhibited different properties after undergoing the methanol boiling phase. The variegated leaf had a green color with white spots and the purple leaf had green color and areas of brown. After that when the 2 leaves were stained with iodine we saw that the variegated leaf had white edges and a purple sections in the middle of the leaf whereas in the purple leaf there were several dark purple big spots on <https://assignbuster.com/measuring-photosynthetic-activity-in-plants/>

the leaf instead of a distinctive isolated area where the starch production takes place.

One of the trends found in this table is that during the beginning phase when the leaves are boiled in water alone they retain their color pigmentation but during the second phase when the same leaves are boiled in methanol their green pigment is almost entirely stripped leaving behind a fine pale white/greenish color. Another trend which is also found from the table is that the geranium leaf kept in conditions with light has more Staining Intensity(Starch Production) in contrast to the Geranium leaf kept in the dark.

Discussions

The trend that the Starches production is higher in leaves that were already had pre existing condition of being exposed to light where as compared to leaf being half exposed to light environment and the other half covered or in dark environment. Plants who are exposed to light are more likely to produce starch as a result of photosynthesis rather than plants which are kept in the dark. As Vodopich mentions in his Biology Manuel that the end product (glucose) of the photosynthesis process is stored as substances called starches. So there fore the starch production is an indirect measure of photosynthesis and vice versa. Also in photosynthesis we need some kind of a light source so therefore we can predict that if an environment has no light it will halt the photosynthesis production and if that happens then we won't be able to makes sugars in the form of starch and get a lack of starch production (Vodopich 143).

Some of the things I expected was for the leaf to keep its green color throughout the experiment and I expected the $\frac{1}{2}$ exposed/ unexposed leaf to show a distinct pattern in starch production but instead the results showed no such clear distinction in the leaf and also the green color also didn't last after the leaves went under the process of being boiled in methanol.

For future investigation I would suggest doing an experiment with more types of leaves for a better accuracy in results. I would also suggest finding the wave length spectrum of the leaves and how much their absorbance's are to see if whether the absorbance spectrums of the leaves correlate with the amount of photo synthesis thus indirectly measuring starch production. Also I would try going outside in the morning and at night and do the procedure mentioned in 13. 6 - 13. 8 to see if there is any difference in starch production. Also I would try experimenting the leaves under different light rather than the standard sun light and compare the amount of starch production between the two different wavelengths of light.

Source Citations

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