

Leaf disc experiment to investigate rate of photosynthesis



In this experiment, the effect of light intensity on rate of photosynthesis was investigated by recording the time taken for the leaf discs to float at the surface of sodium hydrogen carbonate solution in the beaker. This method is more accurate than to immerse a plant and then count the number of bubbles produced per minute. This is because it is easier to observe the leaf discs which are bigger than the bubbles and there is also no need to count the number of bubbles produced at the same time which most probably lose the focus to record an accurate time.

Sodium hydrogen bicarbonate was used in this experiment to supply carbon dioxide to the pineapple leaf discs to perform photosynthesis. The water does not have a high concentration of carbon dioxide dissolved in it but the amount is sufficient for the aquatic plants to survive. Hence, by using sodium hydrogen bicarbonate will increase the concentration of carbon dioxide available for plants to produce glucose and oxygen thus, increasing the rate of photosynthesis.[3] This is important so that the time taken for the leaf discs to float on the surface will not be too long and to get a clearer result as well.

The leaf discs sink when put into the bicarbonate solution. This is because the bicarbonate solution infiltrates the air spaces of the leaf discs causing the overall density to increase. That is why the leaf discs sink. On the other hand, when the leaf discs were left in the beaker under the lamp, we had observed that the leaf discs slowly rise up to surface. The explanation for this is, when photosynthesis occur, oxygen will be released into the interior of the leaf causing the buoyancy to change. Hence, the leaf discs rise up to the surface. However, at a certain times, the leaf discs sink again. This happened

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as respiration process that occurs at the same time, consumed oxygen, thus it removed the oxygen from the air spaces thereby, causing the bicarbonate solution to fill in the spaces again. This therefore, results in the sinking of the leaf discs again. Since both processes took place at the same time, we can say that the result obtained is the net rate of photosynthesis.[4]

Now, to analyse further, when the experiment used white light, the graph produced has a lower rate of photosynthesis compared to that of the other colors such as red and blue light. This is because chlorophyll will only absorb light with a certain wavelength. Since, white light has various colors ranging from violet to red, thus, not all light will be absorb, thus, the source of light will not be fully utilised to perform the photosynthesis process. However, if red light is used, the graph will have a higher rate of photosynthesis as red light has the highest percentage absorbance by the chlorophyll molecules. On the other hand, if the green light is used, a graph with lower rate of photosynthesis will be produced as green light has the lowest percentage absorbance by the chlorophyll molecules. This green light in the white light is the light that is not absorbed by the chlorophyll which makes the rate of photosynthesis of the leaf discs is lower than other leaf discs under other colors of light.

After all the results were obtained, graphs were plotted by using all the data. From graph 8. 21, we can see that as the distance of the bulb of lamp to the base of the beaker increases, the rate of photosynthesis decreases. This is due to the higher light intensity when the distance of the lamp bulb to the bottom of the beaker is shorter. We can see it clearly at the table 8. 24. This happened because higher light intensity will provide higher photon energy to <https://assignbuster.com/leaf-disc-experiment-to-investigate-rate-of-photosynthesis/>

excite electrons of the chlorophyll. Therefore, when this happens, there will be higher amount of energy in the form of ATP to produce a higher amount of glucose and oxygen. Thus, we can conclude that the rate of photosynthesis is higher at the higher light intensity. These explained well on the behavior of graph 8. 22 which we can say that the graph shows rate of photosynthesis is directly perpendicular to the light intensity.

The graph 8. 22 was plotted to show the relationship of light intensity on the rate of photosynthesis. This graph is used to support the graph 8. 21 produced earlier so that the result obtained can be claim to have a high certainty and it is proven to be right. Plus, from the graph 8. 22, we can see that the higher the light intensity, the higher the rate of photosynthesis which is compliment to the theory. This means that both graphs support the theory of light intensity as one the factors that affecting the rate of photosynthesis whereby any decrease in distance or increase in light intensity, will cause to an increase on the rate of photosynthesis.

Conclusion

Hence, based on the discussion above, we can conclude that in any increase of the distance of the lamp bulb to the base of the beaker will cause in the decrease of light intensity. Then, with the increase of light intensity will cause in the decrease in the time taken for the leaf discs to float on the surface of the solution which represents the increase of the rate of photosynthesis. Hence, hypothesis is accepted.

Limitations and Recommendations

Limitations

The leaf discs had difficulties in sinking. This is because liquid of soap was not added into the bicarbonate solution.[5]

Add few drops of liquid of soap into the bicarbonate solution so that the soap will wets the hydrophobic surface of the leaf discs thus allowing the solution to infiltrate to the air spaces more easily.[6]

The stopwatch did not started immediately after the beaker was put under the lamp. Thus, the time taken recorded is shorter than it should be.

Start the stopwatch simultaneously with the placement of the beaker under the lamp. It is best to work with a teammates whereby one settle the beaker placement and another one start the stopwatch.

The size of the leaf discs is not constant. This is due to the difficulties to punch out the leaf discs by using a blunt cork borer.

Recommendations

Use a sharper cork borer to punch out more consistence size of leaf discs. This will help to produce a higher quality results.

Parallex error occurred while measuring 20ml of sodium bicarbonate. This causes the concentration of carbon dioxide for every distance are not constant. Thus affecting the results' accuracy.

Make sure the eyes are positioned directly perpendicular to the scale of measuring cylinder. This will help to reduce parallax error of the volume readings.

Table 8. 25 Limitations While Carrying out the Experiment and Recommendations to Improve the Results Obtain in the Future