**TITLE: THE FLOATING LEAF DISCS FOR INVESTIGATING PHOTOSYNTHESIS.**

**AIM**: to investigate the effect of light intensity on photosynthesis in leaf discs.

**APPARATUS AND MATERIALS:**

* 4 small beakers (100ml)
* 1 large beaker (350ml)
* 2 Styrofoam cups (8oz.)
* Plastic syringe (10ml)
* Hole punch/ small cork borer/ plastic straw
* Timer
* Meter rule/ long ruler
* Stirrer
* Forceps
* Labels
* Light source – bulb socket on a clamp
* 1% Sodium bicarbonate solution – 500ml
* Leaf material e.g. patchoi, spinach
* Distilled water
* Tap water

**INTRODUCTION:**

Leaf disks float, normally. When the air spaces are infiltrated with solution the overall density of the leaf disk increases and the disk sinks. The infiltration solution includes a small amount of Sodium bicarbonate. Bicarbonate ion serves as the carbon source for photosynthesis. As photosynthesis proceeds oxygen is released into the interior of the leaf which changes the buoyancy--causing the disks to rise. Since cellular respiration is taking place at the same time, consuming oxygen, the rate that the disks rise is an indirect measurement of the net rate of photosynthesis.

**METHOD:**

1. Label 2 small beakers – water/ control and bicarbonate solution.
2. Avoiding the large veins in the leaf, use the hole-punch and obtain 50 uniform leaf discs.
3. Remove the plunger from the syringe and place 40 discs into the syringe barrel.
4. Replace the plunger being careful not crush the leaf discs, push the plunger down to about the 3cm3 mark.
5. Pour approximately 50ml of sodium bicarbonate solution into a small beaker. Using the syringe with the leaf discs, pull a small volume of solution (3cm3) into the syringe.
6. Infiltrate the leaf discs
	1. Invert the syringe; push the plunger up until most of the air is out of the syringe.
	2. Hold a finger over the syringe opening, draw back on the plunger and create a vacuum.
	3. Hold the vacuum for about 10 seconds, give a little swirl.
	4. Let go the vacuum and repeat until all the leaf discs sink.
7. Pour the discs and solution into the small beaker with the sodium bicarbonate. Cover the beaker with a Styrofoam cup (the discs will be in the dark).
8. For a control infiltrate about 10 leaf discs with distilled water only. Add a drop of soap if infiltration is difficult.
9. Label an additional 2 small beakers water/ control and bicarbonate solution; add approximately 50ml of water and sodium bicarbonate solution to each respectively.
10. Count out 5 control discs and add to control beaker and then 5 bicarbonate infiltrated discs into the bicarbonate solution beaker.
11. Place both beakers 10cm away from a light source (there should be a large beaker with tap water between the beakers and the light source, switch on the light and start the timer.
12. Record how long it took each disc to float (reach the surface), swirl to dislodge any stuck discs.
13. Discard the contents when all discs in the sodium bicarbonate solution are floating.
14. Repeat steps 10 to 13 using 5 fresh discs and fresh solutions each time for each distance.

**DIAGRAM – SHOWING SET-UP OF THE APPARATUS**



Beaker with water (heat buffer)

Leaf discs in bicarbonate solution

ruler

Light source

**RESULTS:**

**Table showing the effect of light source on leaf discs floating**

|  |  |  |
| --- | --- | --- |
| Time taken for discs to float (sec) | Leaf disc # | Distance from light |
| 10cm | 20cm | 30cm | 40cm |
|  |  |  |  |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |
| mean |  |  |  |  |
| Rate(1/time) |  |  |  |  |

**Plot a graph:** plot a graph of rate of floating (photosynthesis) against the distance (of light source).

**DISCUSSION:**

1. What is photosynthesis? Give a basic chemical equation
2. In this experiment, what was the function of the (a) Bicarbonate solution (b)Oxygen produced (c) increasing distance between light and leaf discs?
3. What other metabolic process was occurring in the leaf discs at the same time of photosynthesis.
4. What precautions did you take (external lights, beaker of water) and why were they used?
5. What do your results show? Refer to the graph – describe its shape and account for it.
6. What were your constant variables and why?
7. How could the experiment be improved to make the results more reliable
8. In this experiment, which stage(s) of photosynthesis is involved? Give equations to support your answer.

**CONCLUSION:**