Investigation Photosynthesis using Spinach Discs

Curricular content:

- SCN 3-02a: I have collaborated on investigations into the process of photosynthesis and I can demonstrate my understanding of why plants are vital to sustaining life on Earth.
- SCN 4-05b: Describe the steps in the carbon cycle and explain processes such as photosynthesis.

Materials

- 4g sodium Hydrogencarbonate solution
- Spinach
- Hole punch / cork borer
- 10cm^3 syringe
- 2x 250cm^3 glass beakers
- 400 cm^3 water
- Light source
- Thermometer
- Waterbath set to 40°C
- Timer

Method

1. Dissolve 4g sodium Hydrogencarbonate powder in 400cm^3 water. Divide the solution equally between 2x 250cm^3 beakers.
2. Place one of the beakers in a waterbath set to 40°C. Keep the other beaker at room temperature.
3. Using a hole punch or cork borer, create 10 discs of spinach from a leaf.
4. Remove the plunger from the 10cm3 syringe. Place 5 of the spinach discs into the syringe barrel.
5. Replace the plunger and push it almost way in. Leave about 2cm3 gap.
6. Draw up ~6cm3 of buffer solution from the beaker sitting at room temperature.
7. Upturn the syringe – the spinach discs will float due to the presence of gases within and between their cells. This air must be removed.
8. Remove most of the air from the syringe by pushing the plunger. Then, place a thumb over the tip of the syringe and draw out the plunger to extract the air from the leaves.
9. Repeat this process several times until all the discs sinks inside the syringe.
10. Remove the plunger from the syringe and allow the spinach discs to fall into the beaker of buffer solution.
11. Place the beaker under a light source and start the timer. Record the time taken (in seconds) for each of the spinach discs to float to the surface. Calculate the average time.
12. Use a thermometer to measure the temperature of the buffer solution placed at “room temperature” and record this in a table.
13. Add the remaining 5 spinach discs to the syringe barrel. Add 6cm^3 buffer from the beaker placed in the 40°C waterbath.
14. Repeat the air-removal process and then dispense the discs into the buffer solution at 40°C.
15. Ensure the light source is held over the spinach discs. Record the time for each of the discs to float. Calculate the average time and add the data to a table of results.

Video tutorial to support: Link