Testing farming prototype for photosynthetic rates

Immobilization of chloroplast suspension

Sucrose solution: 10% sucrose solution is made by dissolving 10g of sucrose in 90 cm^3 of deionized water and making up to 100 cm^3.

[Laboratory grade sucrose, deionized water]

Chloroplast Suspension: Add 100 cm^3 of 10% sucrose solution to the blender with approximately 5 g of the green parts of the ice-berg lettuce leave and blend for 1 minute. Strain the mixture through muslin. The filtrate is the stock chloroplast suspension. This should be dark green.

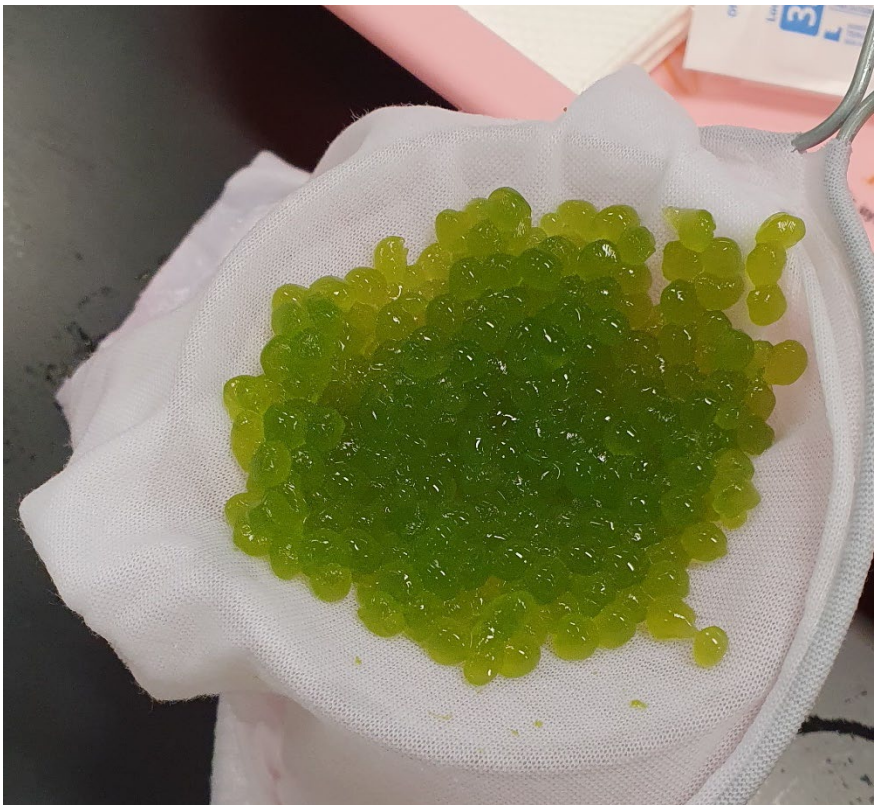
[Ice-berg lettuce, Blender, 10% Sucrose solution]

Sodium alginate: 3% solution of sodium alginate by slowly using a warm hotplate, and it take several hours to mix fully. Once prepared, it lasts for several days in the fridge.

[Sodium alginate from Philip Harris and BDH is recommended, Hot plate, stirrer]

Calcium chloride: 2% calcium chloride solution is prepared.

In a beaker, mix 10 cm^3 of sodium alginate and 10 cm^3 of chloroplast suspension. Set up one 2 cm^3 syringe with the plunger removed by securing in a clamp stand at a height of approximately 10 cm above a beaker containing 2% calcium chloride. The chloroplast-alginate mixture is poured into the syringe so that the gel containing the chloroplast drops slowly into the calcium chloride and form small spheres. The calcium chloride is swirled gently as the balls form. After 10 minutes, the chloroplast balls are washed thoroughly in distilled water.



Rate of photosynthesis

Potassium manganate (VII) indicator solution: Dissolve 0.158g of potassium manganate (VII) in 150 cm^3 of deionized water and making up to 200 cm^3. This makes a 0.005 $moldm^{-3}$ solution.

[Potassium manganate (VII), deionized water]

Sulfuric acid: Add 5 cm^3 of 1.0 $moldm^{-3}$ sulfuric acid to 95 cm^3 deionised water. This makes a 0.05 $moldm^{-3}$ solution]

[Sulfuric acid, deionized water]

Using a 1 cm^3 syringe, add 1 cm^3 of 0.05 $moldm^{-3}$ sulfuric acid to the specimen tube.

Use a clean 1 cm^3 syringe to add 1 cm^3 of potassium manganate (VII) to the sulfuric acid in the specimen tube. Mix the two solutions.

Record the colour of the mixture.

Put in 15 chloroplast balls into the specimen tube. Place the specimen tube in specific location on the prototype. Record the time it takes for the solution to turn colorless. The shorter the time, the faster the rate of photosynthesis.