Effect of nutrients on plant growth (floating culture)

Teacher and technician sheet

The method may be used to investigate the effect of deficiencies in a number of nutrients. A full study would probably take a student or pair of students too long. Instead, students could be allocated one or two nutrients to investigate, done in a way that ensures the class as a whole investigates the effects of deficiencies in each of the essential nutrients.

It might also be modified to study the effect of pollution on plants that grow in streams, rivers and lakes.

Equipment and materials

Each student or pair of students will require:

- Ten healthy duckweed plants (*Lemna)* of similar size.
- Beaker, with plastic film to cover it
- Graph paper
- Complete-nutrient solution and nutrient-deficient solution (containing none of the nutrient you are investigating).

Nutrient solutions

- Complete-nutrient solution. Dissolve the following compounds in 1 dm^3 of deionised water.
  - 0.70 g KNO_3
  - 0.25 g $CaH_4(PO_4)_2.2H_2O$
  - 0.25 g $CaSO_4.2H_2O$
  - 0.25 g $MgSO_4.7H_2O$
  - 0.005 g $FeCl_3.6H_2O$
  - 0.08 g NaCl

- Nutrient-deficient solutions. Make the following changes to the complete nutrient solution formulation:

  Deficient in:

  Nitrogen: replace KNO_3 with 0.52 g KCl

  Phosphorus: replace $CaH_4(PO_4)_2.2H_2O$ with 0.16 g $Ca(NO_3)_2.4H_2O$

  Potassium: replace KNO_3 with 0.59 g $NaNO_3$

  Calcium: replace $CaSO_4.2H_2O$ with 0.2 g K_2SO_4 and $CaH_4(PO_4)_2.2H_2O$ with 0.71 g $NaH_2PO_4.2H_2O$

  Sulfur: replace $CaSO_4.2H_2O$ with 0.16 g $CaCl_2$ and $MgSO_4.7H_2O$ with 0.21 g $MgCl_2.6H_2O$

  Magnesium: replace $MgSO_4.7H_2O$ with 0.17 g K_2SO_4

  Iron: omit $FeCl_3.6H_2O$

Wear eye goggles, iron (III) chloride is corrosive