

Effects of Chemicals on Growth

In addition to the chemicals Carbon, Hydrogen and Oxygen we need other elements for healthy growth.

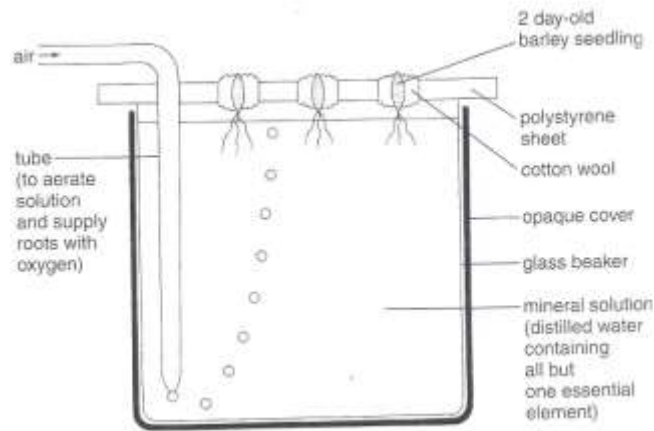
Macro-elements

- Nitrogen (N)
- Phosphorous (P)
- Potassium (K)
- Magnesium (Mg)

Water Culture Experiments

Water culture experiments

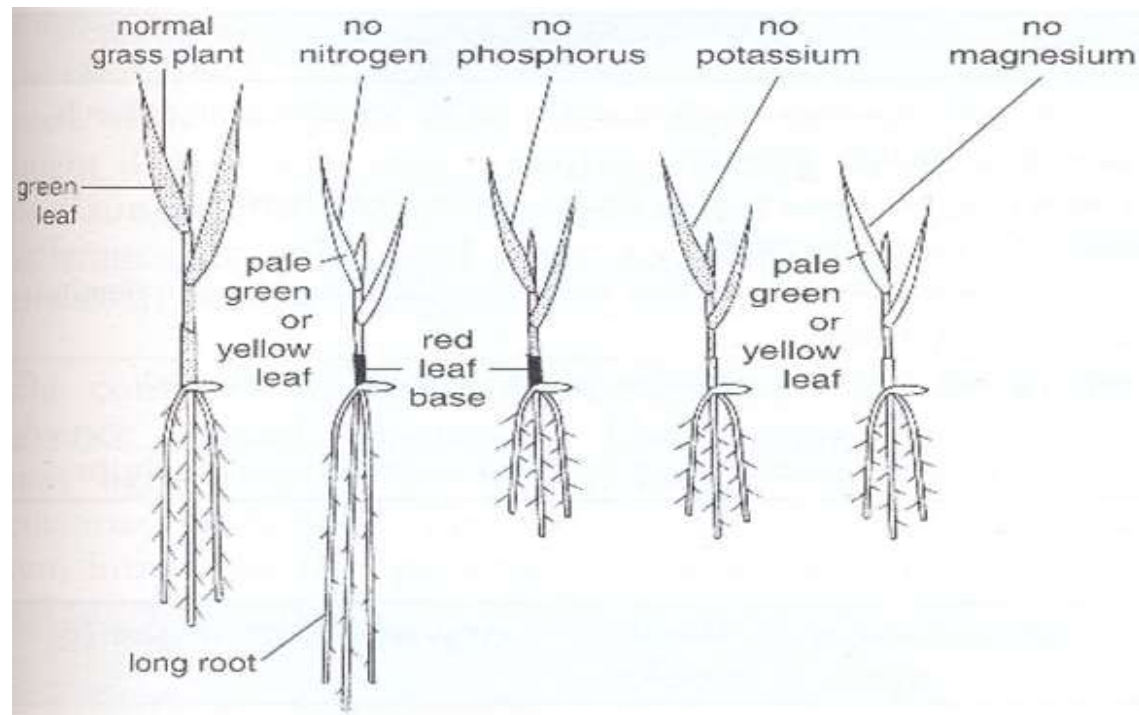
The importance of each macro-element to a plant can be shown in these experiments where one element at a time is omitted from a mineral solution. The control contains all the nutrients needed for growth.



The glass beaker used in the experiment is initially rinsed with concentrated nitric acid to remove traces of mineral elements. It has an opaque covering (aluminium foil) to keep out light and prevent

Effect of Macro-element Deficiency

the growth of algae. Several seedlings are used in each beaker to improve the reliability of the results.



Deficiency Symptoms

Element omitted	Symptoms of deficiency	Reason for deficiency symptom (role of element)
nitrogen	overall growth reduced, leaves chlorotic (pale green or yellow), leaf bases red, roots long and thin	required for formation of amino acids, proteins and nucleic acids
phosphorous	overall growth reduced, leaf bases red	required for formation of ATP and nucleic acids
potassium	overall growth reduced, early death of older leaves	required for important role in transport of molecules across membranes
magnesium	overall growth reduced, leaves chlorotic	required for chlorophyll formation

Exercise Answers

1. Variables controlled were;
seed type, number of seeds, volume of mineral solution, concentration of mineral of solution, darkness, temperature
2. The purpose of the control experiment was for comparison, to show the effect that the presence of all minerals had i.e. to show the marked difference that the lack of this mineral had.
3. Beaker was rinsed with *nitric acid* (to remove traces of elements) and had an *opaque cover* (to stop growth of algae).
4. Lack of magnesium also results in *chlorosis*.

Exercise Answers

5. *Nitrogen* and *phosphorous* are also needed by plants to synthesise DNA.
6. *Potassium* possibly needed for the transport of molecules across membranes.

Success Criteria : I can

- State what ***eutrophication*** is
- Identify ***causes*** of ***algal blooms***
- Describe the effect ***increasing fertiliser concentration*** can have on plant species
- Identify ***macro-elements*** needed by plants
- State the ***purpose of macro-element*** use in plants
- State the effect of ***macro-element deficiency*** in plants