# Investigating the effect of sodium chloride concentration on th growth of germinated seeds Transcript

Because they have a cell wall, plant cells are relatively tolerant of changes in the water potential of their environment.
When placed into a solution of low water potential, plant cells usually become plasmolysed. In this state, the cytoplasm and vacuole shrink as a net volume of water is lost from the cell. This causes the cell membrane to pull away from the cell wall. It may even become completely detached.

These effects are due to osmosis.
In many parts of the world, low-lying fields used to grow crops are flooded by seawater after heavy rains and extreme weather events.

In some countries during winter, salt is put onto roads to help melt the ice. Road salt contains sodium chloride, and this produces a solution that can run off onto fields.

In both situations, the lower water potential of the surroundings can have significant effects on young plants as they develop and grow.
Germination of seeds is a crucial part of a plant's life and early tissues are less tolerant of extreme environmental conditions.

In this investigation, the effect of changing the concentration of sodium chloride, or common salt, will be observed on the germination of mung beans. These are a type of seed.

Your dependent variable in this investigation will be the length of the root after exposing the day-old seedlings to different solutions of sodium chloride for 3 days.

It is important to produce a range of solutions of different sodium chloride solutions that represent a wide range to represent the conditions that seeds might encounter in fields contaminated with saltwater.

This can be achieved by preparing a range of dilutions from the stock solution of sodium chloride (0.2 mol $dm^{-3}$).

To prepare the first dilution, 25 $cm^3$ distilled water is put into a measuring cylinder using the water bottle.

This is poured into a beaker labelled with the first diluted concentration of sodium chloride.

Next, 25 $cm^3$ sodium chloride solution of the highest concentration is poured into the measuring cylinder from the stock beaker.

This is poured into the beaker containing the distilled water measured previously. The solution, which is now half as concentrated as the stock solution, is gently swirled to mix.

To prepare the second dilution, 25 $cm^3$ distilled water is put into the rinsed measuring cylinder using the water bottle in the same way as before.

This is poured into a beaker labelled with the second diluted concentration of sodium chloride.

Next, 25 $cm^3$ sodium chloride solution with the concentration prepared previously is poured into the measuring cylinder from the stock beaker.

This is poured into the beaker containing the distilled water measured previously. The solution, which is now half as concentrated as the solution prepared previously, is again gently swirled to mix.

This process, called serial dilution, is repeated to form another solution of sodium chloride, of the lowest concentration for this investigation.
It is important in this investigation to also include a control experiment.

This will be achieved by exposing some seeds to a solution with no sodium chloride – just distilled water.

This investigation uses recently-germinated seeds. When grown in soil or distilled water, this is how they should develop.

However, it is predicted that this process will not happen in the same way when the seedling is exposed to sodium chloride solutions of greater and greater concentrations.

Enough of the stock solution of sodium chloride is poured onto cotton wool in a Petri dish to ensure that it is saturated.

20 seedlings with noticeable early roots, called radicals, are equally spaced apart on cotton wool in a Petri dish, labelled with the highest concentration of sodium chloride.

This process is repeated for the other four solutions.

The seedlings are kept undisturbed at room temperature for three days.

After 3 days, the seedlings are ready for data collection.

Next, the seedlings are observed.

It is important to note whether the seedling has a plumule, or early shoot.

A ruler can be used to measure the length of the root.

This data can be included in a table. This table shows what data will be recorded for the first Petri dish – for the solution of sodium chloride with the highest concentration.
This is continued until the solution with the lowest concentration of sodium chloride, i.e. distilled water.

A mean can then be calculated to increase the reliability of the measurements of root length.
It is possible to present this data in the form of two bar charts.
Investigations of this type can help to understand the process by which seeds germinate, and how unfavourable conditions can affect their growth.

This can be used to improve the conditions that crop growers use to maximise yield.

They can also be used to inform the work of farmers who selectively breed crops and gene technologists who develop salt-resistant strains of crop plant.