

Investigating nutrient release from slow-release fertilisers

Student worksheet

Background

Slow-release fertilisers (sometimes called controlled-release fertilisers) are designed to make the nutrients that they contain available to plants over a long period of time. This means that compared to water soluble fertilisers, fewer nutrients are lost due to leaching from the soil before they can be used by plants and that fertilisers do not have to be applied so frequently. The disadvantage is that slow-release fertilisers are more expensive than some water soluble fertilisers.

Slow-release fertiliser pellets are given coatings that are semi-permeable. It takes time for water to penetrate through them. The nutrients that they contain may be only slightly soluble. This means that they dissolve slowly over time.

Soluble nutrients dissolve in water in the spaces between soil particles and are taken up by roots of plants.

Purpose of the investigation

This is an open-ended investigation. Its purpose is to find out what affects the release of nutrients from slow-release fertilisers.

You can make a comparative measure of the overall concentration of salts in a solution by measuring the solution's conductivity. This is done using a conductivity meter.

What you can do

- You might find out about the release of nutrients from slow-release fertiliser by putting some of the fertiliser pellets in distilled or deionised water and measuring how the conductivity of the solution changes over several weeks.

Adding about 14 g fertiliser to 100 cm³ water in a 250 cm³ conical flask would be a good combination to start with.

- You could try to find out if temperature affects nutrient release by carrying out several similar experiments at different temperatures.
- You could try to more closely simulate a soil environment by devising an experimental procedure that will allow you to place the fertiliser in a sample of compost or soil and to water it frequently.

Wrapping the fertiliser in an emptied 'tea bag' might make it easier to retrieve for conductivity measurements.

Crushing up the pellets in a pestle and mortar before adding them to water and testing the conductivity of the solution might give an indication of the amount of soluble salts still available within the pellets.

- You could attempt to make your own slow-release fertiliser by coating fertilisers such as ammonium sulfate or urea and compare their effectiveness using the methods above.

You could try Visking tubing as a membrane to enclose the fertiliser.

For coatings you might try using molten sulfur or candle wax.