

Soil test kits

Choosing a kit

Many kits are available to test soil for the presence of nutrients and to measure its pH. They are portable and enable growers to take them into fields and gardens where the measurements need to be made.

Most common are kits that enable pH to be measured and the amounts of primary nutrients (nitrogen, phosphorous and potassium) to be determined. These are relatively inexpensive.

Kits to determine the amounts of secondary nutrients and micronutrients are more expensive. Kits that enable the amounts of all nutrients are available, but they are quite expensive. Test kits for individual nutrients are available. All kits come with full instructions.

Sampling

Samples can be taken by simply scooping up some soil with a trowel. Alternatively, a soil sampling auger, usually made of stainless steel, can be used.

Extraction

The soil sample is shaken with deionised water or a solution such as 1 mol dm^{-3} potassium chloride solution. The extracting solution used depends on the nutrients being analysed. The mixture is filtered to obtain a solution for testing. Details are usually provided with the test kits.

Extractions should be carried out at the same temperature since the rate of soil extraction and the rate of chemical reactions used to develop the colours for analysis depend on temperature. Again, details are provided with the test kits.

pH and acidity/alkalinity

- pH indicator paper or indicator solution; narrow range since pH is generally in range 4-8.

- Titration:

Acidity: $0\text{-}100 \text{ mg dm}^{-3}$ (increment: 1 mg dm^{-3}) or $0\text{-}500 \text{ mg dm}^{-3}$ (increment: 5 mg dm^{-3})

methyl-orange/phenolphthalein indicator;

Alkalinity: $0\text{-}100 \text{ mg dm}^{-3}$ (increment: 1 mg dm^{-3}) or $0\text{-}300 \text{ mg dm}^{-3}$ (increment: 3 mg dm^{-3})

phenolphthalein/bromophenol indicator.

http://www.hannainst.co.uk/product_info.php?cPath=1200_1245&products_id=727

Nutrients

Commercial test kits use a number of techniques for the quantitative analysis of primary, secondary and micronutrients. The three important ones are colorimetry, turbidity and titration.

- Colorimetry: The extract is treated with a reagent that forms a coloured compound with ions of the element. The intensity of the colour is compared with standard solutions.
- Turbidity: The extract is treated with a reagent that forms an insoluble compound with ions of the element. The turbidity (cloudiness) of the suspension is compared with standard suspensions.

- Titration: The extract is treated with a reagent that forms a coloured compound with ions of the element. If the reagent is solid, the number of tablets required to change the colour is counted. If the reagent is in solution, the number of drops required to change the colour is counted.

Analytical tests commonly used in soil-kit tests

Primary nutrients

Nitrogen, N Colour: Reduction to nitrite which is then reacted to form a red azo-dye.

Phosphorus, P Colour: Reaction with ammonium molybdate under reducing conditions in acidic solution to form a blue coloured complex.

Potassium, K Turbidity: Reaction with sodium tetraphenylboron to form an insoluble white complex which produces turbidity.

Secondary nutrients

Calcium, Ca Titration: Tablets are added to a sample of the extract one at a time until the colour changes from pink to violet. The result of the test is calculated from the number of tablets added to the extract sample.

Magnesium, Mg Colour: Reaction to form an orange complex. The reagent produces a yellow colour in the absence of magnesium.

Sulfur, S Turbidity: Reaction with barium chloride to form an insoluble barium salt which produces turbidity.

Micronutrients

Boron, B Colour: Reaction with azomethine-H to produce a yellow solution.

Copper, Cu Colour: Reaction with BCA to produce a purple complex.

Iron, Fe Colour: Reaction with 1,10-phenanthroline to form a orange coloured complex.

Manganese, Mn Colour: Oxidation to permanganate, and reacted with leuco-malachite green indicator to form a blue-green complex.

Zinc, Zn Colour: Reaction with zincon to produce a brownish-green to blue solution.

Finding out

Find out more about soil testing kits, including the nutrient levels they can measure (these are usually given in parts per million, ppm) and the price of kits.

Think about how confident a grower could be about data obtained using these kits.