PFP7 Flame Photometer Protocol: P05-004A

Determination of potassium in plant material

Introduction

Potassium is an important nutrient in plants, essential in many processes needed to sustain plant growth and reproduction. It helps plants to resist drought and the effects of excessive temperatures. It also increases crop resistance to disease. Potassium aids plants in the production of starches, controls root growth and regulates the opening and closing of stomatal pores which is important for efficient water use.

The potassium level in the plant material is measured by oxidising the sample and then ashing it with hydrochloric acid. This is then dissolved in acid and diluted. This solution is then measured against acidified standards.

Materials required

Equipment

Jenway flame photometer
Small crucible (nickel or porcelain)
Accurate balance weighing to 0.0005g
Furnace
Steam bath
Oven
Volumetric flasks

Reagents

1000ppm Potassium standard solution (Jenway Part Number 025 023)
10M Hydrochloric acid
Deionised water

Method

Sample preparation

1. Accurately weigh 2-3g of the ground, oven-dried sample into a crucible.

2. Completely oxidise in a furnace at 500-550°C.

3. Dissolve the ash in hydrochloric acid and allow it to digest on a steam bath for approximately 20 minutes.

4. Evaporate the solution to dryness and heat the residue in an oven for 30 minutes at 105°C to dehydrate the silica.

5. Allow the crucible to cool, return it to the water bath and add 10ml of 10M hydrochloric acid. Warm to dissolve.

6. Transfer 2ml to a 100ml volumetric flask and make up to the mark with deionised water.

Standard preparation

1. Dilute 5ml of the 1000ppm standard to about 900ml with deionised water in a 1 litre volumetric flask.

2. Add 20ml of 10M hydrochloric acid and dilute to the mark with deionised water. This gives a 5ppm working standard solution.

3. Prepare 4, 3 and 2ppm potassium standards by dilution of the working standard ensuring that each contains the equivalent of 2ml of 10M hydrochloric acid per 100ml.

Method

1. Set up the flame photometer as detailed in the instruction manual.
2. Aspirate the blank solution and set the zero.
3. Aspirate the standards into the flame photometer.
4. Plot a standard curve of potassium concentration against intensity.
5. Aspirate the sample solution into the flame and record the reading.
6. From the graph, read off the sample potassium concentration.

Calculation

To calculate potassium concentration in mg/'g of the resin mixture, multiply the concentration of the sample from the graph by 10.

Range

A 2g sample and a 2ml aliquot of dilute solution correspond to a range of 0-5% potassium oxide.