

EXPERIMENT: 14

DIAGNOSIS OF NUTRIENT DEFICIENCIES FOR MINERAL NUTRIENT THROUGH RAPID TISSUE TEST

PRINCIPLE

Plant tissue analysis could directly reflect the nutrient status or nutrient requirement of plants themselves. In recent year, probably as a result of advances in knowledge and understanding of the role and function of nutrient elements, new approaches to diagnosis are being developed which differ in principle from plant analytical techniques. There are two types of plant analysis for confirmation of different symptoms and also for assessing the nutrient status at particular stage of the plant.

There are two types of plant analysis.

1. Tissue testing
2. Whole plant analysis

Tissue testing is done usually with fresh leaves of the plant in the field itself whereas the total plant analysis is performed in the laboratory. These plant analysis methods are based on assumptions that the particular element is an indicator of the supply of that particular nutrient. The whole plant analysis methods involve elaborate equipment and a lot of chemicals and cannot be performed in the field itself. However, tissue testing is done in the field itself and also very rapid. The test is made with fresh plant saps and very useful in quick diagnosis of the needs of growing plant. In the test, the sap from the cell is tested for unassimilated N and K. Test for Fe, Ca and Mg are also used frequently in variety of crops. In general it is necessary to test that specified part of the plant which will give the best indication of the nutritional status.

Table: Specified part of the different crop for nutritional status

CROP	NITROGEN	PHOSPHORUS	POTASSIUM
Maize	Stem, Midribs	Leaf blade	Leaf blade
Soybean	Petiole	Leaf blade	Petiole
`Black gram	Petiole & Lamina	Leaf blade	Leaf blade
Cotton	Petiole	Petiole	Petiole
Papaya	Petiole	Petiole	Petiole
Tomato	Petiole	Petiole	Petiole
Banana	Lamina	Lamina	Lamina

NITROGEN

Reagents

0.1% of Diphenylamine in conc. sulphuric acid

PROCEDURE

Small bits of leaf or petiole are taken in a petridish and a drop of 0.1% diphenylamine is added. The development of blue colour indicated the presence of nitrate nitrogen. Depending on the intensity of blue colour the nutritional status maybe diagnosed sufficient or not sufficient.

Dark Blue - Sufficient

Light Blue - Slightly deficient

No Colour - Highly Deficient

PHOSPHORUS

Reagents

Ammonium molybdate reagent

8 g of ammonium molybdate is dissolved in 200 ml of distilled water. To this solution, added a mixture of 126 ml conc. hydrochloric acid and 74 ml of distilled water slowly by constant stirring. This stock solution is kept in an amber coloured bottle and at the time of use, it is taken and diluted in the ratio of 1:4 with distilled water.

PROCEDURE

Small fine bits of the plant material are taken in a test tube and 10 ml of diluted reagent is added and shaken continuously for a minute. To this added a pinch of stannous chloride powder. The contents were mixed thoroughly and observed for colour development.

Dark Blue- Rich in Phosphorus

Light Blue-Moderately Sufficient

Green or Bluish Green-Deficient

No Colour or Yellow-Highly deficient

POTASSIUM, CALCIUM, MAGNESIUM and CHLORIDE

With Morgan's reagent, the following elements would be detected as soluble potassium, calcium, magnesium and chloride.

Morgan's reagent

10 g of sodium acetate is dissolved in 30 ml of glacial acetic acid (pH 4.8) is used for the extraction.

Preparation of plant extract

Take 4 g of plant sample and add 15 ml of Morgan's reagent. Add pinch of Darco and filter through muslin cloth. This extract could be subsequently used for detection.

POTASSIUM

Reagents

35% Sodium cobalt nitrite

50% Glycerine

Isopropyl alcohol

PROCEDURE

2 ml of Morgan's reagent extract is taken in a test tube and to this added 0.2 ml of sodium cobalt nitrite. 1 ml of 50% glycerine and 2 ml of isopropyl alcohol and observed for colour development.

Clear reddish brown- Insufficient

Deep canary yellow turbidity- Sufficient

CALCIUM

Reagents

50% Glycerin

Ammonium oxalate

PROCEDURE

To 2 ml of morgan's reagent extract, added 2 ml of 50% glycerine and 5 ml of saturated ammonium oxalate.

Colorless- Insufficient

Greenish white turbidity- Sufficient

MAGNESIUM

0.15% Titan yellow

2% Hydroxylamine hydrochloride

5% Sucrose

10% Sodium hydroxide

PROCEDURE

2 ml of Morgan's reagent extract is taken in a test tube. To this 2 ml of Titan yellow, 0.5 ml of hydroxylamine hydrochloride, 0.5 ml of sucrose and 2 ml of 10% sodium hydroxide were added and observed for colour development.

Straw Yellow- Insufficient

Salmon pink colour- Sufficient

CHLORIDE

N/50 silver nitrate

Concentrated Nitric acid.

To 2 ml of morgan's reagent extract, 2 ml of N/50 AgNO_3 and 3 drops of concentrated nitric acid were added and kept for colour development.

Colorless - Insufficient

White turbidity-Sufficient

IRON

Reagents

concentrated sulphuric acid

concentrated nitric acid

20% Ammonium thiocyanate in amyl alcohol

PROCEDURE

0.5 g of the material to be tested is taken in a test tube and added 1 ml of conc. sulphuric acid and allowed to stand for 15 minutes. After that, 10 ml of distilled water and 2-3 drops of concentrated nitric acid are added. After 2 minutes, 10 ml of this solution is taken and 5 ml of 20% Ammonium thiocyanate solution is added and observed for colour development.

Brick red -Sufficient

Faint colour- Deficient

MANGANESE

Sensitive test for deficient leaves

Reagents

Saturated solution of Potassium periodate

1% tetramethyldiaminodiphenyl methane

PROCEDURE

To finely chopped leaf bits, added 2 ml of potassium periodate and 0.4 ml of 1% tetramethyldiaminodiphenyl methane reagent.

The contents were shaken vigorously and observed for colour development.

Pale Blue - Insufficient

Deep Blue – Sufficient

RESULT

CONCLUSION