CALCIUM & CHLORIDE · MODULE A

FOR SOIL MICRONUTRIENTS KIT · CODE 5938-02

COLOR CHART

QUANTITY	CONTENTS	CODE
5 mL	*Chloride Test Solution	*5111-S
30 mL	*Calcium Test Solution	*5108PS-G
1	Color Chart, Calcium in Soil	1303
1	Color Chart, Chloride in Soil	1304
2	Test Tubes, 1-8 mL, plastic, w/caps	0755
2	Test Tubes, plastic, filtrate	0749
1	Spoon, 0.5 g	0698
1	Funnel, plastic	0459
1	Filter Paper, 100/pk	0465
2	Pipets, transfer, plastic	0364
4	Test Tubes, glass	0242
1	Pipet, plain w/cap	0392
1	Pipet, plain, plastic	0352
1	Demineralizer Bottle	1151

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Emergency information for all LaMotte reagents is available from Chem-Tel (US, 1-800-255-3924) (International, call collect, 813-248-0585).

To order individual reagents or test kit components, use the specified code number.

The Demineralizer Bottle will be the source of all the deionized water in these tests. Read the Demineralizer Bottle Instructions before proceeding.

Warning! This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

CHLORIDE IN SOIL TEST

1. Fill a 1-8 mL test tube (0755) to line 5 with deionized water from the Demineralizer Bottle (1151).
2. Use the 0.5 g spoon (0698) to add four level measures of soil. Cap and shake for one minute.
3. Fold a piece of filter paper (0465) in half. Fold in half again. Holding pointed end down, squeeze corners together to form a cone. Insert into funnel (0459).
4. Filter soil suspension through filter paper. The clear soil extract is used for the test.
5. Use a transfer pipet (0364) to add 5 drops of the extract to a test tube (0242).
6. Use the dropping pipet (0352) to add one drop of *Chloride Test Solution (5111). Gently swirl to mix.
7. Hold test tube about one-half inch above the black background in the center of the Chloride Color Chart (1304). Viewing down through the tube, match sample turbidity to a turbidity standard. Record as ppm Chloride.

INTERPRETATION OF CHLORIDE TEST RESULTS

Chlorides are present in small amounts in practically all soils. Large amounts of chlorides in soil may be toxic to growing plants, and may produce stunted plants.

REPLACEABLE CALCIUM IN SOIL TEST

1. Fill a 1-8 mL test tube (0755) to line 7 with *Universal Extracting Solution (5173PS).
2. Use the 0.5 g spoon (0698) to add 4 level measures of soil. Cap and shake for one minute.
   NOTE: When adding samples with high concentrations of carbonates to *Universal Extracting Solution (5173PS), swirl tube to mix for 30 seconds before capping to allow gases to escape.
3. Fold a piece of filter paper (0465) in half. Fold in half again. Holding pointed end down, squeeze corners together to form a cone. Insert into funnel (0459).
4. Filter soil suspension through filter paper. The clear soil extract is used for the test.
5. Use a transfer pipet (0364) to add 5 drops of the extract to a test tube (0242).
6. Use the pipet with the screw cap (0392) to add one drop of *Calcium Test Solution (5108PS). Gently swirl to mix.
7. Hold test tube about one-half inch above the black background in the center of the Calcium Color Chart (1303). Viewing down through the tube, match sample turbidity to a turbidity standard. Record as ppm Calcium.

INTERPRETATION OF REPLACEABLE CALCIUM TEST RESULTS

A lack of calcium in the soil rarely limits plant growth, but it helps to provide a favorable equilibrium between the various constituents in the soil which affect fertility. If there is a deficiency in the replaceable calcium in the soil, the base exchange capacity is incompletely satisfied, resulting in acid soil. Valuable biological processes are dependent upon the important stabilizing effect of calcium in the soil, and without its beneficial effects the nitrification process would bring about a highly injurious acid condition.

Well-limed soils, those that are not naturally in need of lime, contain an abundance of replaceable calcium. Hence, this test can be used to confirm and supplement the interpretation of soil acidity measurements.

The amounts of calcium that are extracted from soil by the leaching solution provide a measure of the amount of calcium contained in the base exchange complex. Soils low in humus and clay give higher values than soils that have a high percentage of colliodal clay and organic matter, unless the latter are strongly acid and, consequently, have most of their calcium replaced by hydrogen-ions.

Normal sandy soils should give 500 ppm calcium; clay soils 1000 ppm; and humus soils, such as peats and forest mold, 500 ppm. Lower results indicate that much of the active calcium of the soil has been replaced by hydrogen or other ions, as in acid or highly alkaline soils.

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65938-A-02 12/19

AMMONIA NITROGEN & NITRITE NITROGEN · MODULE B

FOR SOIL MICRONUTRIENTS KIT · CODE 5938-02

COLOR CHART

QUANTITY	CONTENTS	CODE
30 mL	*Ammonia Nitrogen Test Solution	*5103WT-G
30 mL	*Nitrite-Nitrogen Reagent #1	*5151WT-G
30 mL	*Nitrite-Nitrogen Reagent #2	*5152WT-G
30 mL	*Nitrite-Nitrogen Reagent #3	*5153WT-G
2	Stirring Rods, plastic	0519
2	Spot Plates, double, plastic	0159
1	Spoon, 0.5 g	0698
1	Test Tube, plastic, filtrate	0749
1	Funnel, plastic	0459
1	Filter Paper, 50/pk	0465-H
1	Color Chart, Ammonia Nitrogen in Soil	1302
1	Color Chart, Nitrite Nitrogen in Soil	1310
2	Test Tubes, 1-8 mL, plastic, w/cap	0755
1	Pipet, transfer, plastic	0364

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To order individual reagents or test kit components, use the specified code number.

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Warning! This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

EXTRACTION PROCEDURE

1. Fill a test tube (0755) to line 7 with *Universal Extracting Solution (5173).
2. Use the 0.5 g spoon (0698) to add 4 level measures of soil to the test tube. Cap and shake for one minute.

   NOTE: When adding samples with high concentrations of carbonates to *Universal Extracting Solution (5173), swirl tube to mix for 30 seconds before capping to allow gases to escape.
3. Fold a piece of filter paper (0465) in half, then in half again. Press corners together to form a cone. Place in funnel (0459). Pour extract solution into funnel, collecting extract. This clear extract is used for the test.

AMMONIA NITROGEN TEST

1. Use a transfer pipet (0364) to transfer 4 drops of the soil extract to a large depression on a spot plate (0159).
2. Add 2 drops of *Ammonia Nitrogen Test Solution (5103WT). Stir with a stirring rod (0519). Wait one minute.
3. Match color to a color standard on the Ammonia Nitrogen Color Chart (1302). Record as ppm Ammonia Nitrogen.

INTERPRETATION OF AMMONIA NITROGEN TEST

A low test for ammonia in agricultural soils is to be expected in a fertile soil, unless there has been a recent applicaion of nitrogenous fertilizer in forms other than nitrate. The rapidity of disappearance of ammonia from the soil in such cases is an indication of the desired transformation of ammonia into the more available nitrate compounds.

In forest soils, especially in the humus layers, ammonia is the most abundant available form of nitrogen, and these organic horizons may produce very high ammonia nitrogen concentrations if there is a satisfactory rate of nitrogen transformation.

NITRITE NITROGEN TEST

1. Use a transfer pipet (0364) to transfer 5 drops of the soil extract to a large depression on a spot plate (0159).
2. Add 2 drops of *Nitrite-Nitrogen Reagent #1 (5151WT).
3. Add 2 drops of *Nitrite-Nitrogen Reagent #2 (5152WT). Stir with a stirring rod (0519).
4. Add 10 drops of *Nitrite-Nitrogen Reagent #3 (5153WT). Stir with a stirring rod (0519). Wait one minute.
5. Match sample color to a color standard on the Nitrite Nitrogen Color Chart (1310). Record as ppm nitrite nitrogen.

   NOTE: If the deepest shade of orange represented on the chart is produced, the test should be repeated on a diluted sample. Transfer one drop of the soil extract to the spot plate (0159), and dilute it with four drops of *Universal Extracting Solution (5173) and repeat steps 2-5 of the test. Multiply reading by 5. Record as ppm Nitrite Nitrogen.

INTERPRETATION OF NITRITE NITROGEN TEST

In the production of nitrates in soils, nitrites are formed as an intermediate step. In soils that are well drained and aerated, they are found in very small amounts. An excess of nitrites, which is toxic to plants, may be found in poorly aerated soils and in soils where there is a very large amount of nitrates, part of the nitrate concentration may decompose to give nitrites. A high test for nitrite nitrogen, therefore, indicates a soil condition which may be unfavorable to the formation of nitrates and toxic to plants.

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MAGNESIUM & MANGANESE · MODULE C

FOR SOIL MICRONUTRIENTS KIT · CODE 5938-02

COLOR CHART

QUANTITY	CONTENTS	CODE
30 mL	*Magnesium Test Solution #1	*5140-G
30 mL	*Manganese-Magnesium Solution #2	*5145WT-G
10 g	Manganese Buffer Reagent	6310-D
15 g	*Manganese Periodate Reagent	*6311-E
1	Filter Paper, 50/pk	0465-H
2	Spot Plates, double, plastic	0159
2	Test Tubes, 1-8 mL, plastic, w/caps	0755
2	Plastic Rods, stirring	0519
1	Spoon, 0.5 g	0698
1	Test Tube, plastic, filtrate	0749
1	Funnel, plastic	0459
1	Color Chart, Magnesium in Soil	1306
1	Color Chart, Manganese in Soil	1307-01
1	Pipet, plain, plastic	0364
1	Pipet, plain, glass w/cap	0371
2	Spoons, 0.05 g	0696

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Warning! This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

EXTRACTION PROCEDURE

1. Fill a test tube (0755) to line 7 with *Universal Extracting Solution (5173).
2. Use the 0.5 g spoon (0698) to add 4 level measures of soil to the test tube. Cap and shake for one minute.

   NOTE: When adding samples with high concentrations of carbonates to *Universal Extracting Solution (5173), swirl tube to mix for 30 seconds before capping to allow gases to escape.
3. Fold a piece of filter paper (0465) in half, then in half again. Press corners together to form a cone. Place in funnel (0459). Pour extract solution into funnel, collecting extract. This clear extract is used for the test.

MAGNESIUM TEST

1. Use a transfer pipet (0364) to add 10 drops of soil extract to a large depression on a spot plate (0159).
2. Add one drop of *Magnesium Test Solution (5140). Stir with a stirring rod (0519). Solution will turn pale yellow.
3. Add one drop of *Manganese-Magnesium Solution #2 (5145WT). Stir with a stirring rod. Compare to color standards on Magnesium in Soil Color Chart (1306). Continue adding *Manganese-Magnesium Test Solution #2 one drop at a time until sample color matches a color standard. Record as ppm Magnesium.

   NOTE: It usually requires 2 drops of *Manganese-Magnesium Test Solution #2 to cause color change.

INTERPRETATION OF MAGNESIUM TEST

Soils giving a very low test should be treated with dolomitic lime or fertilizers, such as double-manure salts, which contain considerable magnesia. Soils giving high, or very high, magnesium tests, with low calcium tests, should receive applications of gypsum or high calcic lime, in order to prevent calcium deficiency, due to over-balance of magnesium.

MANGANESE TEST

1. Use a transfer pipet (0364) to add 10 drops of soil extract to the large depression on a spot plate.
2. Use the 0.05 g spoon (0696) to add one measure of Manganese Buffer Reagent (6310). Mix with a clean stirring rod (0519) until the powder dissolves.
3. Use the other 0.05 g spoon (0696) to add one measure of *Manganese Periodate Reagent (6311). Mix with a clean stirring rod for 20 seconds.

   NOTE: The *Manganese Periodate Reagent will not dissolve completely.
4. Match the color in the spot plate to a color standard on the Manganese in Soil Color Chart (1307-01). Record as ppm Manganese.

   NOTE: Immediately clean the spot plate to prevent staining.

INTERPRETATION OF MANGANESE TEST

Manganese occurs in small amounts in all soils, chiefly in insoluble combinations. In some calcareous soils and acid soils, which have been heavily limed, practically no manganese is present in active forms, and some crops are unable to obtain even the small amount necessary to meet their requirements. Poor growth and a yellow, chlorotic condition results.

On the other hand, strongly acid soils may contain injurious concentrations of active manganese compound. Under some conditions liming is a corrective measure.

Manganese is changed by oxidation to less active forms, or may be leached from the soil. Hence, tests are of most significance when made just prior to planting, or during crop growth. A negative test at such time indicates the desirability of applying manganese. Twenty-five pounds of commercial manganese sulfate per acre is usually adequate to correct any possible deficiency. It is doubtful if manganese is needed if any positive test whatever is developed. Medium or low tests are of little significance, except as indicating no manganese deficiency. High, or very high tests are undesirable and indicate a need for lime.

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IRON, ALUMINUM, & SULFATE · MODULE D

FOR SOIL MICRONUTRIENTS KIT · CODE 5938-02

COLOR CHART

QUANTITY	CONTENTS	CODE
30 mL	*Ferric Iron Test Solution	*5116PS-G
10 g	*Iron Reagent Powder	*5275-D
30 mL	*Aluminum Test Solution	*5101-G
30 mL	*Sulfate Test Solution	*5171-G
1	Pipet, transfer, plastic	0364
1	Test Tube, plastic, filtrate	0749
1	Spoon. 0.5 g	0698
1	Funnel, plastic	0459
1	Filter Paper, 50/pk	0465-H
1	Test Tube, glass	0242
2	Test Tubes, 1-8 mL, plastic, w/caps	0755
1	Spot Plate, double. plastic	0159
2	Stirring Rods, plastic	0519
1	Spoon, 0.05g, plastic	0696
1	Color Chart, Active Aluminum in Soil	1301
1	Color Chart, Sulfate in Soil	1314
1	Color Chart, Ferric Iron in Soil	1348
2	Pipets, plain, plastic, w/caps	0392
2	Pipets, plain, plastic	0352

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EXTRACTION PROCEDURE

1. Fill a test tube (0755) to line 7 with *Universal Extracting Solution (5173).
2. Use the 0.5 g spoon (0698) to add 4 level measures of soil to the test tube. Cap and shake for one minute.

   NOTE: When adding samples with high concentrations of carbonates to *Universal Extracting Solution (5173), swirl tube to mix for 30 seconds before capping to allow gases to escape.
3. Fold a piece of filter paper (0465) in half, then in half again. Press corners together to form a cone. Place in funnel (0459). Pour extract solution into funnel, collecting extract. This clear extract is used for the test.

IRON TEST

1. Use a transfer pipet (0364) to add 4 drops of clear filtrate to a large depression on a spot plate (0159).
2. Use the 0.05g spoon (0696) to add one level measure of *Iron Reagent Powder (5275). Stir with a stirring rod (0519).
3. Use pipet (0392) to add one drop of *Ferric Iron Test Solution (5116). Stir with a stirring rod (0519).
4. Match sample color to a color standard on the Ferric Iron in Soil Color Chart (1348). Record as pounds per acre Ferric Iron.

INTERPRETATION OF FERRIC IRON TEST

Most soils will contain iron in sufficient quantities to satisfy the needs of most plants. A deficiency of iron is sometimes noted in alkaline soils, and is indicated by a chlorotic condition of the plants. High tests may be obtained on acid soils.

ALUMINUM TEST

1. Use the transfer pipet (0364) to add 2 drops of clear filtrate to a large depression on the spot plate (0159).
2. Use a plastic pipet (0352) to add 2 drops of *Universal Extracting Solution (5173).
3. Use a second plastic pipet (0352) to add one drop of *Aluminum Test Solution (5101). Stir with a stirring rod (0519). Wait one minute.
4. Match sample color to a color standard on the Active Aluminum Color Chart (1301).

INTERPRETATION OF ALUMINUM TEST

Aluminum occurs in large amounts in all soils in the form of undecomposed minerals, and in the inorganic colloidal materials. In neutral, slightly alkaline or slightly acid soils, the element is in inert combinations that have no effect on plant growth. At greater degrees of acidity, aluminum becomes active, capable of combining as soluble salts, and thus exerting a toxic effect upon the growth of many plants, especially those that are benefited by liming, when grown on acid soils. A high, or very high, test is a certain index of an undesirable acid soil, upon which acid-sensitive crops are almost certain to fail. A medium test is not so serious, especially with grasses, corn, oats, potatoes and tobacco. A low, or negative, test is desirable, except for distinctly acid-tolerant plants.

SULFATE TEST

1. Use the transfer pipet (0364) to add 5 drops of clear filtrate to a test tube (0242).
2. Use a pipet with cap (0392) to add one drop of *Sulfate Test Solution (5171). Gently swirl to mix.
3. Lay Sulfate Color Chart (1314) under neutral light. Hold turbidity vial one-half inch above black strip in middle of chart. Look down through turbid sample. Match sample turbidity to a turbidity standard. Record as ppm Sulfate.

INTERPRETATION OF SULFATE TEST

Plants obtain the sulfur which they require from the sulfates in the soils. Sulfates are usually present in the soil, although a deficiency may exist in some localities. Unless present in excessive quantities, sulfates are not harmful to plants. High tests may indicate recent addition of sulfur or sulfate compounds to soil.

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