

The

Palintest®

System

Instructions

Palintest®

Soil Tests

SOILTESTER System

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The Palintest® System

Soil testing plays a vital role in modern agricultural and horticultural management. Regular assessment of major nutrient and trace element levels in the soil is essential to make fertilizer recommendations, to prevent micro-nutrient deficiencies and to ensure optimum growing conditions.

The Palintest system of soil testing is unique. Simple to use test equipment, and reagents in stable tablet form, mean that reliable results can be obtained by all - users - with or without formal training in soil analysis.

This is why the Palintest system is used by farmers, growers and specialists throughout the world - you can rely on years of Palintest experience for your soil testing needs.

Palintest® Soil Tests - Soiltester System

The Palintest Photometer system offers a precise modern means of soil analysis. The system features the Palintest Photometer 5000 an advanced solid-state digital-readout colorimeter instrument.

The Palintest Photometer 5000 is integrated with the Palintest range of soil extraction and reagent tablets. It offers therefore an instrumental method of analysis for an extensive range of soil tests.

The tests are carried out by first extracting nutrients or trace elements from the soil, and then testing the extracts by simple Colorimetric test procedures. The photometer 5000 accurately assesses the colour formed in the test sample and displays the reading as a digital transmittance readout. The instrument is used in conjunction with a calibration chart for each test and in this way gives an accurate measure of the soil parameter under test.

The tests for soil pH and lime requirement are carried out without the need for separate extraction using the Palintest Soiltester or Palintest pH meter. Certain tests, for example, those for calcium and chloride, do not use the photometer. These tests are carried out on the appropriate soil extract using the Palintest tablet count method.

SOIL ANALYSIS APPLICATIONS

Soil analysis is a complex subject. The wide variation in soil types and crops under cultivation has promoted many different methods of soil analysis. Often the results obtained must be related to the method of analysis used.

Whilst precise laboratory analysis undoubtedly has a vital role, simple methods field testing can be immensely useful in soil management. In particular suits can be obtained quickly and economically. Field tests can be conducted order to make fertilizer recommendations, to check if further tests are needed to determine if samples should be collected for specialist analysis.

Palintest soil tests are equally suited for use in the field and in the laboratory. faintest soil test kits are an important part of any agricultural or horticultural management program.

CORRELATION OF RESULTS

Chemical elements are often strongly bonded or complexed within the soil structure. Soil analysis measures the nutrients or trace elements which are 'exchangeable' or 'extractable under the conditions of the test. The amounts will depend on the nature of the extraction method and the time of contact. Thus whilst a general relationship exists between different methods of soil analysis, precise correlation can sometimes be difficult.

In developing Palintest methods regard has been paid to standard laboratory methods of soil testing (Ref. 1, 2). Correlations have been established for the pH, Lime Requirement, Nitrate (N), Phosphate (P), Potassium (K) and Magnesium methods (Ref. 3). These tests should give similar results to United Kingdom ADAM methods for normal agricultural soils. However, in view of the wide variation in soil types it is not possible to guarantee that precisely similar results will be obtained in all cases.

Test results should always be considered in relation to the fertilizer program applied and the conditions of cultivation. In the event of unexpected test results being obtained, such as very high or very low values, then it is recommended hat samples are submitted for laboratory analysis.

FERTILIZER RECOMMENDATIONS

Fertilizer recommendations are outside the scope of these soil test instructions. t is suggested that users refer to standard fertilizer recommendations such as hose published by ADAS (Ref. 4) in the United Kingdom and by government agencies in other countries.

REFERENCES

1. The Analysis of Agricultural Materials; Agricultural Development and Advisory Service; Ministry of Agriculture, Fisheries and Food; Reference Book RB 427
2. Methods of Soil Analysis; American Society of Agronomy, 1965, 5th printing 1 979.
3. Comparison of Palintest Soil Test Methods with Standard Laboratory Procedures, Colin Marks and Valerie Argent, Palintest Ltd.
4. Fertilizer Recommendations; Agricultural Development and Advisory Service; Ministry of Agriculture, Fisheries and Food; Reference Book 209.

Test Instructions - Soiltester System

Palintest Soil Tests - Soiltester System	Soil.0.
Soil Sampling and Extraction	Soil.2.
Soil Extraction Procedures	Soil..3.
Soil pH/Lime Requirement	Soil..4.
Soil pH/Conductivity	Soil.4.1
Nitrate (N)	Soil.5/N
Phosphate (P)	Soil.5/P
Potassium (K)	Soil.5/K
Magnesium	Soil.6.
Calcium	Soil.11.
Sample Dilution	Gen.6

Booklets supplied with test kits may contain only the relevant test instruction sheets. Additional sheets describing other tests, test equipment or instruments may also be included.

Palintest

Soil Test Instructions

SOIL SAMPLING AND EXTRACTION**SOIL SAMPLING**

A soil sample should be collected from each plot or area to be examined. Separate samples should be collected from each area which differs in soil type, previous cropping history or type of soil management.

Preferably samples of soil should be taken using sampling auger which enables "cores" of soil to be taken from below the surface. Alternatively a piece of narrow rigid tubing may be used. Between 10 and 25 individual cores should be taken from each area to make up the soil sample for analysis. It is customary when the sampling large areas of agricultural land to take cores along the shape of an imaginary W covering the area being sampled. Cores should not be taken close to hedgerows, under trees or adjacent to buildings.

To provide the sample for analysis, the individual cores should be thoroughly mixed in a bucket. Stones and foreign materials should be removed by hand. The soil can be passed through a 2 mm sieve or similar if this is available. The sample can then be transferred to a polythene sample bag.

For field analysis the tests may be conducted directly on the moist sample. Where analysis is to be carried out at a later time it is preferable to dry the sample by spreading it out on a tray or plastic sheet and allowing it to stand in air.

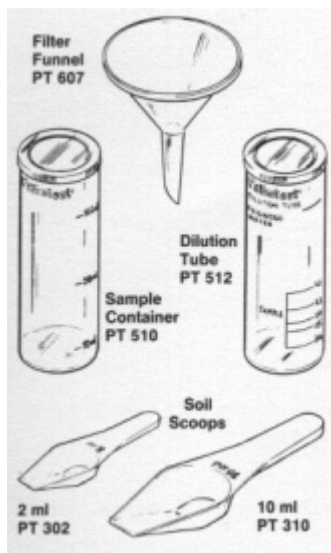
SOIL EXTRACTION

The first stage in the analysis of soil is the preparation of a soil extract. This involves shaking the soil with an extracting solution. Different solutions are used for different tests or groups of tests.

In the Palintest system of soil analysis the extracting solutions are prepared by dissolving the appropriate Extraction Tablet in demonized water (five tablets in 50 ml water). For certain tests the soil is extracted with water alone. Palintest extraction tablet and reagent pack labels are colour coded to ensure that the correct reagents are used with the correct extraction system.

An outline of the extraction scheme used for the various tests is shown in the following table.

Test	Extract	Extraction Tablets	Water	Soil	Label Colour
Soil pH Lime Requirement	No extraction required. Tests are carried out directly on the Soil Sample.				White
Nitrate (N) Manganese	Extract N	5 Extraction N plus Nitratest Powder	50 ml	2 ml	Green
Phosphate (P)	Extract P	5 Extraction P	50 ml	2 ml	Blue
Potassium (K)	Extract K	One level 2.5 scoop Extraction K Powder	50 ml	2 ml	Yellow
Calcium Magnesium Aluminum Ammonia Iron	Extract A	5 Extraction A	50 ml	10 ml	Pink
Copper	Extract C	5 Extraction C	50 ml	10 ml	Purple
Chloride Sulphate	Extract W	Demonized Water Only	50 ml	10 ml	White



Palintest Soil Test kits contain extraction tablets appropriate to the tests included in the kit.

Equipment Needed

The equipment needed to prepare the soil extracts, and included in Palintest soil test kits, is listed below.

Two Palintest Sample Containers 100/50/10 ml, plastic (PT 510)

Soil Scoop 2 ml (PT 302) or 10 ml (PT 310)

Filter Funnel 7 cm, plastic (PT 607)

Filter Papers No. 40, 11 cm diameter (PT 618)

It is important to ensure that the sample containers and the filter funnels are clean before the start of each extraction. It is important to wash out all traces of the previous extracting solution as these can seriously contaminate subsequent tests. The sample containers and filter funnel must be thoroughly washed out and then rinsed with demonized water between each extraction. Syringes used to measure extract solutions must be thoroughly cleaned between each test.

Filtering and Extract

After the soil has been shaken with the extracting solution for the prescribed period it must be filtered through filter paper to produce a clear extract. The filtration is carried out in the following manner.

Take the filter paper circle, fold in half and then fold again into a quarter. Insert a finger between the folds and form the paper into the shape of a cone. Insert the filter paper cone into the filter funnel then place the funnel on the top of a clean sample container.

Pour the soil slurry into the funnel and allow the extract to drip through into the sample container. Discard the first few drops of the extract, then collect the extract in the sample container.



It is not necessary to collect all of the extract solution. Most of the Palintest procedures have been based on a 10 ml sample of extract for the tests to be carried out then discard the rest of the soil slurry.

Diluting Soil Extracts

The composition of different soils varies enormously and test results can extend over a wide range of values. Palintest soil test ranges have been selected to cover the test values most likely to be encountered in garden or agricultural soils. With particular soil types however, or for certain tests, higher values than the test range may be encountered. In these cases it is necessary to dilute the soil extract to bring the solution within the test range.

To simply dilution procedures a special Dilution Tube is included in kits. The Dilution Tube enables the extract to be diluted by a factor of 2, 3, 4, 5, or 10 times (see GEN.6).

It is not possible to dilute the sample when carrying out the Soil pH or Lime Requirement tests.

Temperature

Temperature affects the rate of soil extraction and the rate of chemical reactions. Palintest soil tests have been calibrated at a temperature of 20°C. Palintest soil extraction procedures and chemical tests should be carried out with the solution as close to 20°C as possible for optimum results.

Important

The success of the soil tests will depend on following the test instructions carefully and on maintaining clean working conditions throughout the test procedures. Always wash and rinse equipment thoroughly before and after use.

Palintest
Soil Test Instructions

SOIL EXTRACTION PROCEDURES

Soil extraction is the first stage in soil testing. The soil is shaken with an extracting solution in order to extract the nutrient or trace element from the soil. These test instructions give the procedures for preparing soil extracts.

Prepare the soil extract according to the procedure below, appropriate to the soil test being carried out. Turn then to the test instructions for the particular test parameter. These give the procedures for completing the test on the prepared soil extract.

Certain groups of tests use the same extraction procedure. It is only necessary to prepare a single extract for each group of tests. When carrying out a full analysis of the soil the procedures outlined below will be helpful in planning out the most logical sequence for carrying out the tests. Note that individual test kits may not contain all the test listed.

NOTE THAT THE EXTRACTION PROCEDURES USE TWO DIFFERENT SIZES OF SOIL SAMPLE SCOOP - 2 ML AND 10 ML

Extract N for Nitrate and Manganese Tests

1. Fill the sample container to the 50 ml mark with deionised water.
2. Add five Extraction N tablets, cap tube and shake to disintegrate.
3. Add one level 2 ml scoop of soil, cap tube and shake for one minute.
4. Add one level cap-spoonful of Nitratest N Powder, cap tube and shake for one minute.
5. Filter and collect Extract N in a clean sample container.

Extract P for Phosphate Test

1. Fill the sample container to the 50 ml mark with deionised water.
2. Add five Extraction P tablets, cap tube and shake to disintegrate.
3. Add one level 2 ml scoop of soil. Cap tube and shake for one minute. With acid soils some effervescence may be produced - release tube cap periodically to allow any pressure build-up to escape.
4. Filter and collect Extract P in a clean sample container.

Extract K for Potassium Test

Extraction K has now been changed to a powder formulation. A blue 2½ ml scoop is included in the Extraction K bottle - it is important that this scoop should **NOT** be used for measuring soil.

1. Fill the sample container to the 50 ml mark with deionised water.
2. Add one level 2½ ml scoop of Extraction K powder, cap tube and shake to disperse.

3. Add one level 2 ml scoop of soil, cap tube and shake for one minute.
4. Filter and collect Extract K in a clean sample container.

Extract A for Calcium, Magnesium, Aluminum, Ammonia and Iron Tests

1. Fill the sample container to the 50 ml mark with deionised water.
2. Add five Extraction A tablets, cap tube and shake to disintegrate.
3. Add one level 10 ml scoop of soil, cap tube and shake for two minutes.
4. Filter and collect Extract A in a clean sample container.

Extract C for Copper Test

1. Fill the sample container to the 50 ml mark with deionised water.
2. Add five Extraction C tablets, cap tube and shake to disintegrate.
3. Add one level 10 ml scoop of soil, cap tube and shake for two minutes.
4. Filter and collect Extract C in a clean sample container.

Extract W for Chloride, Sulphate and Conductivity Tests

1. Fill the sample container to the 50 ml mark with deionised water.
2. Add one 10 ml scoop of soil, cap tube and shake for two minutes.
3. Filter and collect Extract W in a clean sample container.

Soil pH and Lime Requirement

No extraction required. Tests are carried out directly on soil sample.

Palintest
Soil Test Instructions

SOIL pH

Colour Match Method
Using Palintest Soiltester
RANGE 4 - 8

Soil pH is a measure of the hydrogen ion activity and is important in determining the availability of plant nutrients. Agricultural soils generally lie within the pH range of 4 - 8.

Neutral soils have a pH value close to 7.0. Soils are considered alkaline if the pH is above 7, and acidic if the pH is below 7. Soils below pH 5 are strongly acidic and will only support acid loving plants.

In the Palintest Soil pH test a sample of the soil is shaken in water with an indicator/flocculant tablet. The coloured layer which separates out is compared against colour standards in the Palintest pH Soiltester.

Reagents and Equipment

Palintest Soil pH Tablets
Palintest pH Soiltester (PT 320)
Soil Scoop 2 ml (PT 302)

Test Procedure

Use the left-hand side of the Soiltester for acid soils and the right-hand side for neutral or alkaline soils. For unknown soils use both sides of the Soiltester.

1. Take a level 2 ml scoop of soil and place in the Soiltester tube. Fill to the 10 ml mark with deionised water.
2. Add one Soil pH tablet then shake the Soiltester gently for one minute.
3. Allow the soil to settle then compare the solution against the Soiltester colour standards under daylight conditions. The reading obtained represents the soil pH value.

Note:

With certain soils the suspension may be slow to settle and the colours may appear weak. In such cases the test should be repeated using two Soil pH tablets.

Palintest

Soil Test Instructions

LIME REQUIREMENT

Colour Match Method
Using Palintest Soiltester
0 - 34 tonne/ha

The "Lime Requirement" of a soil is a measure of the quantity of liming material required to raise the pH of the soil to a specified value. The specified pH value is 6.5 for mineral soil, 6.2 for organic soil and 5.8 for peaty soil. It is not necessary to test soils where the existing pH is higher than these values since, in such cases, the lime requirement will be zero.

In the Palintest Lime Requirement test, the soil is shaken with a pH buffer and the extent to which the soil modifies the buffer pH is used to determine the lime requirement. The test is carried out as an extension of the Soil pH test. The value given is the amount of calcium carbonate required to raise a 20 cm depth of soil to the pH value specified for the particular soil type.

Reagents and Equipment

Palintest Soil pH Tablets
Palintest Lime Buffer Tablets
Palintest pH Soiltester (PT 320)
Soil Scoop 2 ml (PT 302)

Test Procedure

Use the left-hand side of the Soiltester for acid soils with an anticipated high lime requirement. For unknown soils use both sides of the Soiltester.

This test may be carried out as a continuation of the Soil pH test. In this case go directly to step 3 of the instructions below.

1. Take a level 2 ml scoop of soil and place in the Soiltester tube. Fill to the 10 ml mark with deionised water.
2. Add one Soil pH tablet then shake the Soiltester gently for one minute.
3. Add one Lime Buffer tablet and shake the Soiltester gently for two minutes.
4. Allow the soil to settle then compare the solution against the Soiltester colour standards under daylight conditions. Note the Modified pH reading of the buffer.
5. Refer to the Lime Requirement table appropriate to the type of soil under test. The tables show the lime requirement expressed in terms of calcium carbonate (CaCO_3). Quantities are given in various units commonly used in agriculture.

Lime Requirement Tables

Mineral Soils

Mineral soils contain less than 10% organic material

Soiltester Reading (Modified pH)	Lime Requirement (CaCO ₃)			
	tonne/ha	gram/m ²	cwt/acre	oz/sq yard
4.0	30	3000	240	90
4.5	25	2500	200	75
5.0	20	2000	160	60
5.5	15	1500	120	45
6.0	10	1000	80	30
6.5	4	400	30	12
7.0	0	0	0	0
7.5	0	0	0	0
8.0	0	0	0	0

Organic Soils

Organic soils contain 10 - 25% organic material

Soiltester Reading (Modified pH)	Lime Requirement (CaCO ₃)			
	tonne/ha	gram/m ²	cwt/acre	oz/sq yard
4.0	32	3200	225	95
4.5	26	2600	210	78
5.0	21	2100	165	61
5.5	15	1500	120	45
6.0	10	1000	75	28
6.5	4	400	30	12
7.0	0	0	0	0
7.5	0	0	0	0
8.0	0	0	0	0

Peaty Soils

Peaty Soils contain greater than 25% organic material

Soiltester Reading (Modified pH)	Lime Requirement (CaCO ₃)			
	tonne/ha	gram/m ²	cwt/acre	oz/sq yard
4.0	34	3400	270	100
4.5	28	2800	225	85
5.0	22	2200	180	65
5.5	17	1700	135	50
6.0	11	1100	85	32
6.5	5	500	40	15
7.0	0	0	0	0
7.5	0	0	0	0
8.0	0	0	0	0

The lime requirement values given in the above tables should be regarded as maximum values. Over liming should be avoided as this may give rise to trace element deficiencies.

Liming Materials

The results of the Palintest Lime Requirement test are given in terms of calcium carbonate (ground limestone or chalk). In practice, a variety of liming materials are used and regard must be paid to the neutralising value of these materials in order to determine the amounts required from the results given as calcium carbonate.

Palintest
Soil Test Instructions

POTASSIUM (K)

Photometer Method
520 nm
0-725 mg/l K

Potassium, the third of the major nutrients, increases resistance to disease and hardens plant tissue.

In the Palintest Potassium (K) test, the soil is extracted using 0.1M magnesium acetate in a soil:water ratio of 1:25. The extracted potassium is reacted with sodium tetraphenylboron to form an insoluble white complex which produces a turbidity in the test sample. The degree of turbidity is proportional to the potassium level in the soil sample and is determined by using a Palintest Photometer.

Reagents and Equipment

Palintest Potassium K Tablets
Palintest Photometer
Round Test Tubes, 10 ml glass (PT 515)

Soil Extraction

This test is carried out on **Extract K** (see SOIL.3)

Test Procedure

1. Fill a round glass test tube to the 10 ml mark with Extract K.
2. Add one Potassium K tablet, crush and mix to dissolve.
3. Stand for two minutes. A cloudy solution indicates the presence of potassium.
4. Select wavelength 520 nm on Photometer.
5. Take photometer reading (%T) in usual manner (see photometer instructions).
6. Consult Potassium (Soil) calibration chart to find the potassium concentration in the soil.

POTASSIUM SOIL	mg/l K									
	520 nm 1:25 EXTRACTION									
%T	9	8	7	6	5	4	3	2	1	0
90	15	20	25	35	40	45	50	55	55	60
80	65	65	70	75	75	80	80	85	90	90
70	95	95	95	100	100	105	105	105	110	110
60	110	115	115	115	120	120	120	125	125	130
50	130	130	135	135	135	140	140	140	145	145
40	150	150	155	155	160	160	165	165	170	170
30	170	175	175	180	180	185	190	195	200	205
20	215	225	230	240	250	260	270	280	295	315
10	330	350	365	385	405	430	450	475	500	430
0	560	595	625	725	-	-	-	-	-	-

NOTES

1. Photometer readings on turbidity-based tests should be carried out under shaded conditions to avoid light being reflected into the instrument. Always shade the top of the Photometer when taking readings under strong light or sunlight.
2. High levels of ammonia nitrogen may interfere with the potassium test. The test should not be used within two weeks following application of farmyard manure.

Palintest
Soil Test Instructions

NITRATE (N)**Colour Match Method**
Palintest Soiltester
0 - 25 mg/l N

Nitrate Nitrogen (N) is an important plant nutrient which promotes foilar growth and increases yield.

In the Palintest Nitrate test, the soil is extracted using 1 M ammonium chloride at a soil:water ratio of 1:25. The extracted nitrate is reduced to nitrite and reacted to form a red azo-dye. The intensity of the red colour produced is proportional to the nitrate in the soil sample and is determined by comparison against colour standards in the Palintest N/P Soiltester.

Reagents and Equipment

Palintest Extraction N Tablets
Palintest Nitratest N Powder
Palintest Nitricol N Tablets
Palintest N/P Soiltester (PT 321)

Sample container and equipment for soil extraction and filtration as previously described.

Soil Extraction - Extract N

1. Fill the sample container to the 50 ml mark with deionised water.
2. Add five Extraction N tablets, cap the tube and shake to disintegrate.
3. Add one level 2 ml scoop of soil, cap the tube and shake for one minute.
4. Add one level cap-spoonful of Nitratest N powder, cap the tube and shake for one minute.
5. Filter and collect Extract N in a clean sample container. For optimum results, carry out the test as soon as sufficient extract has been collected.

Test Procedure

1. Fill the lefthand side of the N/P Soiltester with Extract N to the 10 ml mark.
2. Add one Nitricol N tablet, crush and mix to dissolve.
3. Stand for 10 minutes to allow full colour development.
4. Compare the solution colour against the Soiltester colour standards. The matching colour represents the nitrate nitrogen level in the soil as milligrams per litre N.

Palintest
Soil Test Instructions

PHOSPHATE (P)

Colour Match Method
Palintest Soiltester
0 - 120 mg/l P

Phosphate (p) is a major plant nutrient. It is particularly beneficial in stimulating root growth.

In the Palintest Phosphate test the soil is extracted using 0.5 M sodium bicarbonate at a soil:water ration 1:25. The extracted phosphate is then reacted with ammonium molybdate under reducing conditions in acidic solution to form a blue coloured complex. The intensity of the blue colouration is proportional to the phosphate level in the soil and is measured by comparison against colour standards in the Palintest N/P Soiltester.

Reagents and Equipment

Palintest Extraction P Tablets
Palintest Acidifying P Tablets (or Palintest Acidifying S Tablets)
Palintest Phosphate P Tablets
Palintest N/P Soiltester (PT 321)

Sample container and equipment for soil extraction and filtration as previously described.

Soil Extraction - Extract P

1. Fill the sample container to the 50 ml mark with deionised water.
2. Add five Extraction P tablets, cap the tube and shake to disintegrate.
3. Add one level 2 ml scoop of soil, cap the tube and shake for one minute. With acid soils some effervescence may be produced; release the tube cap periodically to allow any pressure to escape.
4. Filter and collect exactly 10 ml Extract P in a clean sample container. Remove filter funnel or transfer to a new container.
5. Take the sample container containing exactly 10 ml Extract P and add one Acidifying P tablet (or three Acidifying S tablets). The tablet will effervesce. Do not cap the tube or shake vigorously. Allow the tube to stand until the effervescence ceases, then crush the remainder of the tablet and mix to dissolve.

Test Procedure

1. Fill the righthand side of the N/P Soiltester with Acidified Extract P to the 10 ml mark.
2. Add one Phosphate P tablet, crush and mix to dissolve.
3. Stand for 10 minutes to allow full colour development.
4. Compare the solution colour against the Soiltester colour standards. The matching colour represents the nitrate nitrogen level in the soil as milligrams per litre P.

Palintest
Soil Test Instructions

MAGNESIUM (Mg)

Colour Match Method
Palintest Soiltester
0 - 500 mg/l Mg

Magnesium is an essential element for the growth of green plants. The ration of calcium to magnesium is also an important factor in determining the availability of nutrients. If there is an excess of magnesium over the amount of calcium in the soil, plant growth can be seriously affected.

In the Palintest Magnesium test, the soil is extracted using 1M potassium chloride at a soil:water ratio of 1:5. The extracted and exchanged magnesium is then reacted to form an orange complex. The reagent produces a yellow colour in the absence of magnesium. The intensity of the orange colour produced is proportional to the magnesium in the soil sample and is determined by comparison against colour standards in the Palintest Soiltester.

Reagents and Equipment

Palintest Magnecol S Tablets
Palintest N/Mg/P Soiltester (PT 322)
Syringe, 1 ml, plastic (PT 361)

Soil Extraction

The test is carried out on **Extract A** (see Soil.3)

Test Procedure

1. Using the plastic syringe take exactly 1 ml Extract A. Discharge the syringe into either tube of the N/Mg/P Soiltester, then fill the tube to the 10 ml mark with deionised water.
2. Add one Magnecol S tablet, crush and mix to dissolve.
3. Stand for 2 minutes to allow full colour development.
4. Compare the solution colour against the Soiltester Mg colour standards. The matching colour represents the magnesium concentration in the soil.

Palintest
Soil Test Instructions

CALCIUM

Tablet Count Method

0 - 2500 mg/l Ca

The amount of exchangeable calcium is an important factor in classifying soil and in making fertilizer recommendations. Calcium stimulates root development and influences the uptake of other nutrients. The ratio of calcium to magnesium is particularly important in determining nutrient availability.

In the Palintest Calcium test, the soil is extracted using 1M potassium chloride at a soil:water ratio of 1:5. The extracted and exchanged calcium is then determined by the Palintest tablet count method. 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.

Reagents and Equipment

Palintest Calcium S Tablets
Palintest Sample Container, 100/50/10 ml plastic (PT 510)

Soil Extraction

The test is carried out on **Extract A** (see Soil.3)

Test Procedure

1. Take 10 ml Extract A in the sample container. Add deionised water to make up to approximately the 50 ml mark. (The amount of deionised water added is not critical - this is merely to increase the working volume of the solution to aid dissolving the tablets and observation of the colour change).
2. Add one Calcium S tablet and shake the container until the tablet disintegrates.
3. Continue adding tablets, one at a time, until the colour of the solution changes from pink to violet.
4. Note the number of Calcium S tablets used. Calculate the result of the test using the formula given below. This gives the calcium level in the soil expressed as mg/l Ca.

$$\text{Calcium (mg/l)} = \text{Number of Tablets} \times 250$$

LOW CALCIUM SOILS

For soils with an expected low calcium content, it is preferable to carry out this test on 50 ml of Extract A, made up to approximately 100 ml with deionised water. The result should then be calculated as follows:

$$\text{Calcium (mg/l)} = \text{Number of Tablets} \times 50$$

Palintest

Test Instructions

SAMPLE DILUTION

INSTRUCTIONS FOR USE OF THE PALINTEST DILUTION TUBE AND DILUTION SYRINGES

Palintest tests are usually carried out directly on the sample collected. In some situations however it is desirable to dilute the sample in order to bring it within the correct test range. Indeed dilution of samples is a very useful technique in that it enables the range of the test to be greatly extended.

Whilst dilution is a simple operation, it often causes confusion to test kit users. The Palintest Dilution Tube (PT 512) has been developed to provide simple means of sample dilution for water and aqueous extracts. The dilution tube can be used to dilute the sample by a factor of 2, 3, 4, 5, or 10 times.

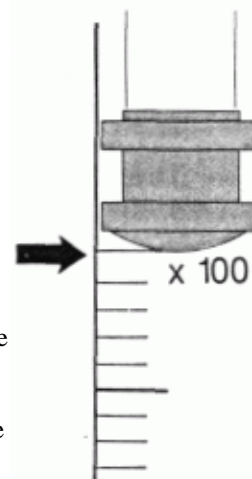
Palintest Dilution Syringes are used in those situations where a greater degree of dilution is required. Dilution syringes are available in two sizes and are used in conjunction with the dilution tube. Dilution syringe 10/100 (PT 375) can be used to dilute the sample by a factor of 10, 20, 25, 50 or 100 times. Dilution syringe 100/1000 (PT 376) can be used to dilute the sample by a factor of 100, 200, 250, 500 or 1000 times.

Using the Dilution Tube

1. Decide on the degree of sample dilution required. For example, if the solution is about 5 times too strong for the test range being used, then the sample should be diluted by a factor of five.
2. Fill the tube with the sample to one of the sample marks as appropriate. For example, if a 5 times dilution is required, fill to the x5 mark.
3. Fill the tube with demonized water to the line marked 'Demonized Water'.
4. Cap the tube and mix the solution.
5. Use the diluted sample in the test being carried out in the normal manner.
6. Multiply the test result obtained by the dilution factor used. For example, if the tube was originally filled to the x5 mark, then the kit result should be multiplied by 5 to give the concentration in the original sample.

Using the Dilution Syringe

1. Decide on the degree of sample dilution required. For example, if the solution is about 100 times too strong for the test range being used, then the sample should be diluted by a factor of 100.
2. Dip the tip of the syringe into the sample and draw up the sample into the syringe. Adjust the level of the sample in the syringe until it corresponds to the appropriate mark (see figure).
3. Discharge the solution from the syringe into a clean dilution tube. Fill the tube with demonized water to the line marked 'Demonized Water'.



4. Cap the tube and mix the solution.
5. Use the diluted sample in the test being carried out in the normal manner.
6. Multiply the test result obtained by the dilution factor used. For example, if the syringe was originally filled to the x100 mark, then the test kit result should be multiplied by 100 to give the concentration in the original sample.

Demonized Water

Demonized water is required for sample dilution and for the general rinsing of test tubes, etc. The Palintest De-Ion pack has been specially developed to provide demonized water with test kits both in the field and in the laboratory.

The Palintest De-Ion pack produces approximately 5 litres of demonized water in 2-5 minutes from mains water or from clean natural water sources. Instructions for using the De-Ion pack are given on the product label and carton.

Notes

1. In certain Palintest methods the dilution stage is written into the test procedure. It is not necessary to multiply by the dilution factor if the test kit or calibration chart is already calibrated for a similarly diluted sample.
2. When using the Palintest Interface Photometer 7000, it is possible to key in the dilution factor at the start of the test. In this way the instrument can be used to get a direct reading of the test result for the original sample.
3. Dilution tubes and syringes should be rinsed thoroughly after use with demonized water. For accurate results it is most important to ensure that diluted solutions are not contaminated with undiluted samples.