Nutrient Advantage
Test Method References

Nutrient Advantage®
Knowledge | Productivity | Responsibility

SOIL CHEMICAL METHODS Analyses performed on soil dried at 40ºC and ground to <2mm using a hammer mill and sieve	Analysis equipment	Reference	Rayment & Lyons method
Active Carbon (0.033M $KMnO_4$)	FIA	1	6E1
Ammonium Nitrogen & Nitrate Nitrogen (1M KCl)	FIA	1	7C2b
Chloride (1:5 water)	FIA	1	5A2b
Boron (Hot $CaCl_2$)	ICP-OES	1	12C2
Calcium Carbonate Percentage (% $CaCO_3$ equivalent)	Titration	1	19A1
“Fizz” test (carbonate qualitative field test)	Visual assessment	1	19D1
Electrical Conductivity (EC, 1:5 water)	Combination electrode	1	3A1
pH (1:5 water)	Combination electrode	1	4A1
pH (1:5 $CaCl_2$)	Combination electrode	1	4B4
Exchangeable Aluminium (1M KCl)	ICP-OES	1	15G1
Exchangeable Cations: Calcium, Magnesium, Potassium, Sodium (1M Ammonium Acetate)	ICP-OES	1	15D3
Exchangeable Cations - Calcium, Magnesium, Potassium, Sodium (1M Ammonium Acetate, with soluble salt pre-treatment)	ICP-OES	1	15D1
Exchangeable Cations - Calcium, Magnesium, Potassium, Sodium (Alcoholic NH4Cl at pH 8.5, with soluble salt pre-treatment, Tucker)	ICP-OES	1	15C1
Exchangeable Cations - Calcium, Magnesium, Potassium, Sodium, Aluminium ($BaCl_2$/NH_4Cl, Gillman & Sumpter)	ICP-OES	1	15E1
Mehlich 3 extractable elements: P, Ca, Mg, Na, K, Cu, Fe, Mn, Zn, B, S, Al	ICP-OES	1	18F1
Molybdenum (hot $CaCl_2$)	ICP-MS	1	12E1
Organic Carbon (Walkely & Black)	UV-VIS	1	6A1
Phosphorus Buffer Index, PBI (requires Phosphorus Colwell test)	ICP-OES	1	9I2b
pH Buffer (Liming requirement, Mehlich single buffer)	Combination electrode	1	16C1
Phosphorus (DGT)	FIA	2	
Phosphorus (BSES, H_2SO_4)	FIA	1	9G2
Phosphorus (Bray I)	FIA	1	9E2
Phosphorus (Bray II)	FIA	3	
Phosphorus (Olsen)	FIA	1	9C2b
Phosphorus (Colwell)	FIA	1	9B2
Potassium (Colwell)	Flame AAS	1	18A1
Potassium (Nitric)	ICP-OES	1	18C1
Potassium (Skene)	ICP-OES	4	
Potentially Mineralisable Nitrogen, PMN (Requires Moisture test. 10 day TAT)	FIA	1	7D2b
Saturated Paste/Extract: Electrical Conductivity	Combination electrode	1	14B1
Saturated Paste/Extract: Calcium, Magnesium, Sodium, Potassium, Sulphur, Phosphorus	ICP-OES	1	14F1
Silicon (BSES, H_2SO_4)	FIA	1	13D1
Silicon ($CaCl_2$)	FIA	5	
Sulphur (KCl 40ºC)	ICP-OES	1	10D1
Sulphur (MCP)	ICP-OES	1	10B3

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Total Nitrogen (Kjeldahl digestion)	FIA	1	7A1
Total Nitrogen (Combustion, Elementar Vario MAX Cube)	Combustion	1	7A5
Total Carbon (Combustion, Elementar Vario MAX Cube)	Combustion	1	6B2b
Total (Acid digestion) Phosphorus, Aluminium, Cadmium, Calcium, Chromium, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Sodium, Sulphur, Zinc	ICP-OES	1	17B1
Trace Elements: Copper, Iron, Manganese, Zinc (DTPA)	ICP-OES	1	12A1
Zinc (HCl)	ICP-OES	1	12D1
Cation Exchange Capacity (CEC)	Calculation	1	15J1
Calcium / Magnesium ratio	Calculation	1	15M1
Percentage Aluminium Saturation	Calculation	1	15O1
Exchangeable Sodium Percentage (ESP)	Calculation	1	15N1
Electrical Conductivity of Saturated Extract (ECSE)	Calculation	1	15J1

SOIL PHYSICAL METHODS Analyses performed on soil 'as received'.	Analysis equipment	Reference
Dispersion & Slaking (Index 1 to 16, Normal agricultural assessment)	Visual assessment	6
Dispersion (Classes 1 to 8, Construction or agricultural assessment)	Visual assessment	7
Moisture (at 105ºC)	Oven/Balance	8
%Gravel	2mm Sieve & Balance	
%Sand (2mm – 0.02mm), %Silt (0.02 – 0.002mm, %Clay (<0.002mm) & Texture (Australian Texture Triangle)	Soil Hydrometer	9
%Course Sand (2mm – 0.2mm), %Fine Sand (0.2mm – 0.02mm), %Silt (0.02 – 0.002mm, %Clay (<0.002mm) & Texture (Australian Texture Triangle)	Soil Hydrometer & Wet Sieve	9
Soil Colour (colour group via comparison to soil Munsell charts)	Visual assessment	10
Texture (Northcote field technique)	Subjective assessment	11

PLANT TISSUE, GRAIN, MANURE, COMPOST, MILL MUD/ASH Analyses performed on plant material dried at 70ºC and ground to <1mm	Analysis equipment	Reference
Ammonium Nitrogen (1:125 water extract)	FIA	12
Nitrate Nitrogen (1:125 water extract)	FIA	13
Chloride (1:125 water extract)	FIA	14
Moisture (at 70ºC)	Oven/Balance	15
Total Elements: Boron, Calcium, Copper, Iron, Magnesium, Manganese, Phosphorus, Potassium, Sodium, Sulphur, Zinc (HNO_3 and H_2O_2 digestion)	ICP-OES	16
Total Elements: Cobalt, Molybdenum, Selenium (HNO_3 and H_2O_2 digestion)	ICP-MS	16
Total Nitrogen (Kjeldahl digestion)	FIA	17
Total Nitrogen (Combustion, Elementar Vario MAX Cube)	Combustion	17
Total Carbon (Combustion, Elementar Vario MAX Cube)	Combustion	18

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WATER METHODS	Analysis equipment	Reference	APHA methods
Aluminium	ICP-OES	19	3120 B; 3030 B
Bicarbonate Alkalinity	Titration	19	2320 B
Carbonate Alkalinity	Titration	19	2320 B
Total Alkalinity	Titration	19	2320 B
pH	Combination electrode	19	4500-H+B
Electrical Conductivity	Combination electrode	19	2510 B
Chloride	FIA	19	4500-Cl-G
Ammonium Nitrogen	FIA	19	4500-NH3-H
Nitrate Nitrogen	FIA	19	4500-NO3-I
Sodium	ICP-OES	19	3120 B; 3030 B
Potassium	ICP-OES	19	3120 B; 3030 B
Calcium	ICP-OES	19	3120 B; 3030 B
Magnesium	ICP-OES	19	3120 B; 3030 B
Sulfur	ICP-OES	19	3120 B; 3030 B
Iron	ICP-OES	19	3120 B; 3030 B
Boron	ICP-OES	19	3120 B; 3030 B
Copper	ICP-OES	19	3120 B; 3030 B
Zinc	ICP-OES	19	3120 B; 3030 B
Manganese	ICP-OES	19	3120 B; 3030 B
Phosphorus	ICP-OES	19	3120 B; 3030 B

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