

Chemical analysis methodology for Karawatha Peri-Urban Soil Characteristics Data 2007

Chemical analysis was conducted in the University of Queensland soil laboratory

Methods outlined here refer to the specific in the "The Australian Handbook of Soil and Water Chemical Methods", Rayment GE and Higginson FR, Inkata press, 1992.

1) pH / EC

1:5 soil water extracts are prepared and mixed for 1 hour. Conductivity and pH electrodes are used to measure the respective properties (Handbook section : 3A1, p15 and 4A1, p17).

2) Chemical analysis

Colwell P 1:30 soil solution extracts in 0.5 M sodium bicarbonate are prepared and mixed for 16 hrs, with the extracted phosphorous present being determined colorimetrically on centrifuged and filtered extracts using a Pharmacia Ultrospec 2000 spectrophotometer and the ammonium molybdate / ascorbic acid colour reaction with potassium antimonyl tartrate added to control the reaction rate. Calculation: Sample concentrations obtained above in mg/L are converted to mg/kg by multiplying by the volume and dividing by the weight (Handbook section : 9B1, p64).

Exchangeable bases (Ca, K, Mg and Na) and CEC 1:10 soil solution extracts are prepared in 1 M ammonium chloride and mixed for 1 hr, with the exchangeable bases being determined on centrifuged and filtered extracts using a Varian Vista Pro ICPOES instrument. Calculation: Sample concentrations obtained above in mg/L are converted to mg/kg by multiplying by the volume and dividing by the weight. Conversion to meqv or centimoles per unit charge is done by dividing the mg/kg results by the atomic molecular weight and then by dividing again by either 10 for monovalent species (Na and K) or 5 for divalent species (Ca and Mg). The CEC result is the summation of the meqv results for each of the 4 cations. ESP is the sodium percentage of the CEC result, while SAR is the sodium concentration divided by the square root of half the combined results for calcium and magnesium (Handbook section: 15E1, p164).

Carbon and nitrogen: 0.5 g of sample is weighed out into a ceramic boat and acidified with 5 M HCl to remove any inorganic carbonates that may be present in the sample. The acidified sample is then placed into the induction furnace of a LECO CNS 2000 combustion analyser set at 1100 degrees C and calibrated on EDTA. The carbon present is combusted to CO₂ which is determined with an infra red detection cell. The nitrogen present is combusted to N₂, NO₂ and NO. The oxides are reduced to N₂ which is determined quantitatively using a thermal conductivity cell. Calculation: Results are automatically expressed as weight percentages. To convert to mg/kg multiply the Wt % result by 10000 (Handbook section: 6B3, p36).

Ammonium nitrogen: 1:10 soil solution extracts in 2 M potassium chloride are prepared and mixed for 1 hr, with the extracted ammonium nitrogen present being determined

colorimetrically on centrifuged and filtered extracts using a SEAL AQ2+ colorimetric analyser. The chemistry used is the reaction of ammonia with sodium salicylate and nitroprusside in a weakly alkaline buffer in the presence of free chlorine to produce an easily determinable ammonium salicylate complex using at a wavelength of 650 nm. Calculation: Sample concentrations obtained above in mg/L are converted to mg/kg by multiplying by the volume and dividing by the weight. Reference (not in handbook): A manual Colorimetric Procedure for Measuring Ammonium; Baethgen, WE; Commun in Soil Sci Plant Anal; 20 (9 & 10); p 961.

Nitrate nitrogen: 1:10 soil solution extracts in 2 M potassium chloride are prepared and mixed for 1 hr, with the extracted nitrate nitrogen present being determined colorimetrically on centrifuged and filtered extracts using a SEAL AQ2+ colorimetric analyser. The chemistry used reduces the nitrate to nitrite using a cadmium reduction column and then measures the colour produced by reacting the nitrite with sulfanilamide and NED at 540 nm. Calculation: Sample concentrations obtained above in mg/L are converted to mg/kg by multiplying by the volume and dividing by the weight (Handbook section: 7B1, p45).

3) Soil physical characteristics

Soil particle size and particle distribution was analysed using the "Bouyoucos Hydrometer Method" outlined in the "Methods manual for forest soil and plant analysis" by Y. P. Kalra and D. G. Maynard, Forestry Canada, 1991. The samples were taken through the steps of the analysis to estimate the relative proportion of clay, silt and sand particles in the soil.