

Gypsum

Solid phase water-soluble sulfates, especially gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) occur in many Australian soils in low rainfall areas and in wetter areas with high evaporation rates (Rayment *et al.* 1983). Gypsum is also added to soils as a source of soluble S and also as a soil amendment to lessen the adverse consequences of high soil sodicity (Shaw 1988). It follows that the analysis of soils for gypsum could encounter indigenous gypsum of varying purity as well as applications that may exceed many tonnes/ha (e.g. Rayment and Ahern 1988).

Two methods are provided. The first (Method 11A1) is a chemical procedure based on soil extraction with water, the selective precipitation of gypsum with acetone, re-dissolution in water and finally the measurement of calcium (Ca^{2+}), as a component of the gypsum. The second (Method 11A2) is an indirect method guided by Beech *et al.* (2003) and based on MIR diffuse reflectance spectroscopy. If virtually all the total S is derived from gypsum, then an estimate of the maximum amount of gypsum in the sample can also be obtained by multiplying total S by the factor 5.37 (Beech *et al.* 2003). Table 11.1 has summary details on the two gypsum methods. More details on each are covered in method preambles.

11A1 Total gypsum

This method for gypsum in soil involves extraction with water in which gypsum is soluble to the extent of approximately 0.2 g/100 mL. This corresponds to 2% gypsum in soil following extraction at a 1:10 soil/water ratio. The maximum content of gypsum extracted at a 1:10 ratio should not exceed 1.5%, however, as the rate of dissolution of gypsum in water slows considerably near to its saturation point. Wider soil/water ratios must be employed when higher concentrations of gypsum are expected.

Following extraction, gypsum is selectively precipitated with acetone, redissolved in water, and gypsum determined by measuring Ca^{2+} concentration in solution (Hesse 1971).

Table 11.1. Summary details of method codes, method titles, technologies and notes on methods for gypsum in soils.

Code	Technology	Test method	Notes
11A1	Aqueous dissolution, selective precipitation of gypsum with acetone, redissolution in water and final measurement of Ca.	Total gypsum.	Most suited to soils with <2% gypsum.
11A2	MIR reflectance spectroscopy indirect method.	Total gypsum - MIR reflectance spectroscopy.	Method is particularly suited to gypsum alone. Its applicability for estimating gypsum in soil is subject to overcoming soil matrix effects.