

Reliability of Gypsum Determination in Soils by Three Existing Simple Methods

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ABSTRACT. The reliability of three existing simple and relatively rapid methods was evaluated using synthetic (standard) samples (2 - 80 %, w/w gypsum) and samples from 35 horizons of Aridisols and Entisols in Saudi Arabia. Method (I) is based on kinetics of the dehydration process of soil at 150 °C. Method (II) is based on loss of crystal water of gypsum upon heating at 105 °C. In method (III) gypsum was measured conductometrically after its extraction in water, precipitation in acetone and redissolution in water.

Consistently, the thermogravimetric methods overestimated whereas the conductometric method underestimated the gypsum, present in the synthetic samples. The accuracy obtained followed the order I > II > III. Constant errors were observed in the range of 2 - 35 % gypsum whereas proportional errors were observed in the range of 35 - 60 % gypsum. The composite measure of accuracy and precision, however, indicated that the three methods were of similar high reliability;

$$\left[\text{error}^2 + \frac{(\text{standard deviation})^2}{2} \right]^{\frac{1}{2}} = 0.66 \% \text{ gypsum};$$

using two independent measurements. Differences in the accuracy of methods II and III (over the range 2 - 80 % gypsum) were used to obtain trends of the accuracy that associated measurements in the 35 soil samples. Of these measurements, 25 showed accuracy comparable to that obtained from the synthetic samples. Two samples (sandtextured) yielded more gypsum by method III whereas two Gypsiorthids (relatively rich in soluble Ca⁺⁺) gave less gypsum by method II than methods I and III. Six samples of different properties showed smaller amounts, than expected, by method III. In spite of these discrepancies, the three methods are sufficiently reliable for soil gypsum determination (taxonomical and managerial) and for comparative studies.

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