

The measurement of Extractable Organic Sulfur by Near-Infrared Spectroscopy

Dr Kyle Devey¹, Dr Roger Hill¹

¹Hill Laboratories

Extractable Organic Sulfur (EOS) is an estimate of the available sulfur pool in soil. It is an alternative to the widely used sulfate test, but does not suffer the same in-field variability that sulfate does. Sulfate is often elevated by dung and urine events, and has high temporal and spatial variation. While EOS does not suffer the same in-field variation, it does suffer high analytical measurement variation.

Extractable Organic Sulfur (EOS), is typically determined from a potassium phosphate extraction, and taking the difference between the total extracted sulfur (TES) and the sulfate extracted. The total extracted fraction is typically measured by an Inductively Coupled-Plasma Optical Emission Spectroscopy (ICP-OES) instrument, and the sulfate by ion chromatography. As the EOS measurement is the difference, the uncertainty in the measurement is coupled to the measurements of the other two. As typical with analytical measurements, there is a component of error associated to the concentration of the individual analytes, thus when sulfate (and therefore TES) is high, the uncertainty associated to this, is also high in absolute terms (though still low in relative terms). This means that for high TES or sulfate values, the analytical error in the EOS method can be very high, to the point of making the result meaningless.

Near-Infrared (NIR) has been used for many years to measure some other soil constituents at Hill Laboratories particularly those associated with the organic fraction in soil. It has been recently found that a successful calibration for EOS can be also constructed. Although, the NIR measurement is most probably an indirect measure of the EOS through the vibrations associated to the organic matter fraction, the error associated to the measurement does not scale with TES or sulfate concentration. Thus the NIR method for EOS is typically more accurate than the reference method for soils with high sulfate.