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64277 Effect of Cation Ratio On Soil Structural Stability Is Related to the Zeta Potential of Dispersed Clay.

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Alla's abstract Effect of cation ratio on soil structural stability is related to the zeta potential of dispersed clay
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Abstract: Water interaction with soil aggregates leads to clay swelling and dispersion, resulting in the deterioration of soil structure with reduction in soil porosity, aeration and water movement. The integrity of soil aggregates depends on the degree of ionicity of clay-cation bonds which determines the interaction of polar water molecules. Based on this, Rengasamy and Marchuk (2011) have proposed, instead of using sodium absorption ratio (SAR), the use of cation ratio of soil structural stability (CROSS) which takes into account the differential effects of Na and K in dispersing soil clays, and the differential effects of Ca and Mg in flocculating soil clays. CROSS ($\text{mol}^{0.5} \text{m}^{-1.5}$) is defined as $(\text{Na}+0.56\text{K}) \cdot (\text{Ca}+0.6\text{Mg})^{-0.5}$. It is calculated from the concentrations of Na, K, Mg and Ca in soil-water extracts. Spontaneously dispersed clay from a number of soils collected from different locations in South Australia containing varying amounts of Na, K, Mg and Ca was highly correlated with CROSS rather than SAR. The relative changes in hydraulic conductivity of four soils was also highly correlated with CROSS rather than SAR. It was found that the effects of CROSS, at a comparable ionic strength, were influenced by soil pH and organic matter content. While increasing pH increased the amount of dispersible clay, the increasing organic matter reduced it. In all cases, the zeta potential of dispersed clay was highly correlated with the amount of dispersed clay, indicating that the net charge on soil clays affected by soil components is an important factor in soil structural stability. Further experiments are in progress to develop 'Quirk-Schofield' type threshold electrolyte concentration in relation to CROSS for a more general application by including net charge of soils as a third factor and thereby eliminating the variations caused by pH and organic matter.