Super Absorbent Polymer effects on Soil Physical Properties as Functions of Application Rate and Soil Texture[1]

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Abstract: Super absorbent polymers (SAPs) are materials that can absorb significantly more water or aqueous solution than their mass. The nature and properties of SAPs make them a widely utilized material across many disciplines. The objectives of this study were to determine the physical effects of SAP application rates across five soil textures, namely water retention and liquid limits. To each texture, SAP application rates were 0, 0.4%, 0.8% and 2% by soil mass. For water retention, matric potentials of -0.1, -0.3, and -15 bar were used and to determine the liquid limits the fall-cone method was used. Gravimetric water content increased with application rate across all soil textures with the increase being greatest in soils with higher sand concentrations. For example, there was a 218% increase in water content for the Williams soil (Fine-loamy), and a 114% increase for the Fargo soil (Clay). Liquid limit results suggest that SAP application increases the water content at the liquid limit and preliminary analysis indicates that the application rate of SAP is significant ($p<0.05$). Understanding the physical properties and SAP behavior will give us insight into potential field applications, such as reducing soil compaction and allowing for extended periods of plant-available soil water.

Additional key words: Gravimetric, water retention, liquid limit

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