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# Using Biopolymer Materials to Enhance Sandy Soil Behavior

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**Abstract :** Nowadays, strength characteristics of soils have more importance due to increasing building loads. In some projects, geotechnical properties of the soils are be improved using man-made materials varying from cement-based to chemical-based. These materials have proven successful in improving the engineering properties of the soil such as shear strength, compressibility, permeability, bearing capacity etc.. However, the use of these artificial injection formulas often modifies the pH level of soil, contaminates soil and groundwater. This is attributed to their toxic and hazardous characteristics. Recently, an environmentally friendly soil treatment method or Biological Treatment Method (BTM) was to bond particles of loose sandy soils. This research paper presents the preliminary results of using biopolymers for strengthening cohesionless soil. Xanthan gum was identified for further study over a range of concentrations varying from 0.25% to 2.00%. Xanthan gum is a polysaccharide secreted by the bacterium Xanthomonas campestris, used as a food additive and it is a nontoxic material. A series of direct shear, unconfined compressive strength, and permeability tests were carried out to investigate the behavior of sandy soil treated with Xanthan gum with different concentration ratios and at different curing times. Laser microscopy imaging was also conducted to study the microstructure of the treated sand. Experimental results demonstrated the compatibility of Xanthan gum to improve the geotechnical properties of sandy soil. Depending on the biopolymer concentration, it was observed that the biopolymers effectively increased the cohesion intercept and stiffness of the treated sand and reduced the permeability of sand. The microscopy imaging indicates that the cross-links of the biopolymers through and over the soil particles increase with the increase of the biopolymer concentration.

**Keywords :** biopolymer, direct shear, permeability, sand, shear strength, Xanthan gum
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