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TITLE OF PROJECT:

Enhancing Soil Stability through Microbial Induced Calcite Precipitation (MICP): A Bio-augmentation Approach with *Bacillus Subtilis* and *Bacillus Megaterium*.

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ABSTRACT: The primary consideration in the construction of any proposed structure is the type of soil present at the construction site and its bearing capacity. Soil stabilization is a critical process aimed to amplify the bearing capacity of soil and reducing the footing size, thus improving the cost-effectiveness of the proposed structure.

Soil stabilization techniques are classified into physical/mechanical and chemical processes. Traditional chemical methods are widely employed, and lime (quick lime or hydrated lime) is the most efficient and effective method. Non-traditional methods include using bitumen, cement, asphalt, ionic stabilizers, and ash produced by coal-based thermal power plants.

Soil which are rich in montmorillonite content are considered as expansive and weak soil. It should be treated to enhance engineering properties of soil. There are various methodology to stabilize the soil but enhancing engineering properties of soil with the help of microorganism and Urea hydrolysis leads to sustainable development and future avenues. *Bacillus subtilis* and *Bacillus megaterium*, in conjunction with urea, calcium chloride, nutrient broth and vermicompost, were employed for soil stabilization in this study. The application of MICP technique aims to enhance clay properties by leveraging microorganisms. Through bio-augmentation, varying proportions of cementation reagent and bacteria were blended with clay soil, resulting in the formation of calcite precipitation that binds the particles together. As a result, an initial decrement of swell height by 59.59% in the process is observed, followed by a subsequent reduction in values, with no discernible change upon the addition of cementation reagent and bacteria beyond a specific threshold.

KEYWORDS: Bearing capacity of soil, *Bacillus subtilis* and *Bacillus megaterium*, soil stabilization, Urea hydrolysis, nutrient broth.

CATEGORY: Geotechnical Engineering