Etiology, diagnostic approaches and management strategies of Acidovorax citrulli, a bacterial fruit blotch pathogen of cucurbits

ABSTRACT

Marine clay soils are problematic soils in the construction industry when they are subjected to construction loads. When these soils are loaded, they lose their structure. This leads to the soil being unable to withstand loads of any magnitude without exhibiting significant, permanent deformations. In order to stabilize the marine soil, new methods for soil improvement were built upon biogrouting by incorporating physical, biological and chemical treatments into the soil. However, the biggest challenge of this method is the bacteria migration through the soil medium. To overcome this issue, the electrokinetic phenomenon can be utilized alongside biogrouting to prevent the bacteria migration. In this regard, the present study applied electrobiogrouting stabilization to investigate the improvement of acidic marine clay soil with a pH of 3.69. To accomplish this, two large-scale physical models with dimensions of 500 × 300 × 1200 mm were fabricated to examine the influence of two different treated distances between the inlet and outlet—450 mm (D45) and 600 mm (D60)—on the stability of the treated soil. It was observed that the shear strength of the treated soil improved significantly. The shear strength at the D45 treated distance increased from 3.65 kPa (untreated soil) to 28.14 kPa (treated soil). However, the strength increased by increasing the treated distance. In addition, compressibility and soil electrical conductivity were reduced significantly, and the Atterberg limits were significantly enhanced from OH to OL. The reasons for the enhancement of treated soil were the formation of CaCO3, which filled the soil voids, and that the water content was reduced. To address issues with marine clay soil, this study aims to minimize the high cost of a special foundation system and the use of non-environmentally friendly materials such as calcium-based binders, aside from the reduction of deformations caused by loading. The findings of this study can be used for acidic soils and the improvement of soil's geotechnical behavior in general.

Keyword: Biomineralization; Bacillus pasteurii; Marine clay; MICP; Soil improvement; Acidic soil; Soil treatment