

Investigate the Mechanical Effect of Different Root Analogue Models to Soil Strength

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Abstract : Stabilizing slopes by using vegetation is considered as a cost-effective and eco-friendly alternative to the conventional methods. The main aim of this study is to investigate the mechanical effect of analogue root systems on the shear strength of different soil types. Three objectives were defined to achieve the main aim of this paper. Firstly, explore the effect of root architectural design to shear strength parameters. Secondly, study the effect of root area ratio (RAR) on the shear strength of two different soil types. Finally, to investigate how different kinds of soil can affect the behavior of the roots during shear failure. 3D printing tool was used to develop different analogue tap root models with different architectural designs. Direct shear tests were performed on Leighton Buzzard (LB) fraction B sand, which represents a coarse sand and Huston sand, which represent medium-coarse sand. All tests were done with the same relative density for both kinds of sand. The results of the direct shear test indicated that using plant roots will increase both friction angle and cohesion of soil. Additionally, different root designs affected differently the shear strength of the soil. Furthermore, the directly proportional relationship was found between root area ratio for the same root design and shear strength parameters of soil. Finally, the root area ratio effect should be combined with branches penetrating the shear plane to get the highest results.

Keywords : leighton buzzard sand, root area ratio, rooted soil, shear strength, slope stabilization

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