STABILIZATION OF BLACK COTTON SOIL USING TERRAZYME

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Introduction:
Expansive soils are termed as problematic soils which cause swelling and shrinkage resulting in damages in the form of cracking, undulations, different settlements etc., experienced by road, buildings, canals etc. An attempt is made to improve strength and to stabilize the soil by using Terrazyme. Soil stabilization is a collective term for any physical, chemical, or biological method, or any combination of such methods that may be used to improve certain properties of a natural soil to make it serve adequately an intended engineering purpose. It is the process of blending and mixing materials with a soil to improve certain properties of the soil. The process may include the blending of soils to achieve a desired gradation or the mixing of commercially available additives that may alter the gradation, texture or plasticity, or act as a binder for cementation of the soil.

Black Cotton soils are inorganic clays of medium to high compressibility and form a major soil group in India. Black Cotton soil has a high percentage of clay, which is predominantly montmorillonite in structure and black or blackish grey in color. Because of its high swelling and shrinkage characteristics, the Black Cotton soil has been a challenge to geotechnical and highway engineers. The soil is very hard when dry, but loses its strength completely when in wet condition.

Terrazyme is a liquid enzyme which is organic in nature and is formulated from the vegetables and fruit extract. It improves the quality of soil like CBR, Durability and decreases the OMC, Plasticity index of soil. The effect of Terrazyme on soil is permanent and the soil become bio-degradable in nature.

Objectives:
1. To evaluate the effect of Terrazyme on the basic properties of soil.
2. To determine the geotechnical properties of black cotton soil
3. To determine the effects of adding enzyme to black cotton soil on its properties like consistency limits, standard proctor test, Free swell index, California bearing ratio test and unconfined compressive strength of the soil.

Materials used:
BLACK COTTON SOIL
• Expansive or swelling soils are soils, which swell when subjected to moisture and shrink when dry.
• These are enriched with calcium carbonate, magnesium, potash and lime which are all nutrients.
• It increases the Fertility, erosion resistance and properties of retaining moisture in their grain are the most useful condition for better crops growth.

**TERRAZYME**

• It is a liquid chemical used as a stabilizer in soil stabilization.
• Terrazyme increases the durability of pavement and reduces the swelling properties of soil.
• The use of Terrazyme enhances weather resistance and improves load bearing capacity of soils.

**Methodology:**

Following Laboratory tests were carried out on the samples of black cotton soil with and without Terrazyme:

1. Specific Gravity
2. Consistency limits
   • Liquid Limit (%)
   • Plastic limit (%)
   • Plasticity index
3. Free swell index
4. Compaction test
5. Grain size distribution
   • Gravel (%)
   • Coarse sand (%)
   • Fine sand (%)
   • Silt and clay (%)
6. Unconfined compressive strength of soil
7. California bearing ratio test

**Conclusions:**

Based on the tests conducted the following conclusion have been drawn which are applicable only to materials used and test condition adopted in this study.

• It decreases the liquid limit as Terrazyme content increases and also it reduces the plasticity index and increases the plastic limit.
• Enzyme (Terrazyme) reduces the compaction effort and improves soil workability during specimen preparation; where MDD increases and OMC decreases with addition of Bio-Enzyme (Terrazyme).
• It decreases the swelling property as addition of Terrazyme increases with black cotton soil.
• It reduces the maintenance cost and increase the life cycle due to higher strength and stiffness achieved by using Terrazyme.

**Future scope:**

1. Other enzyme and their effect on soil can be studied.
2. Further test can be performed for permeability, Direct shear test and dynamic behavior of soil to improve the soil property.
3. Terrazyme effect on the soil with varying dosage and in varying stabilizing duration.

**References:**

2. “Effect of Terrazyme usage on increase of CBR” Technical report by soil mechanics laboratory National Road Department, Thailand, 1996.