

An Experimental study on Stabilization of black cotton soil using Terrazyme

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Abstract - Extended soils, also known as volatile soils, have a tendency to shrink and swell with varying degrees of moisture content. As a result of this variability of the soil, significant degradation of the soil occurs, which in turn causes damage to the upper structures. During rainy seasons, like heavy rains, the soil becomes wet and swollen; after that, they soften and their water retention capacity decreases. In contrast, during the dry season, such as in summer, this soil loses its moisture content by evaporation, making it even harder. Overcoming this Terrazyme as the bioenzyme is used for permanent stability. In this study, terrazyme of different doses was used for stabilization and tests were performed on each sample. Sample strength increases with increasing volume due to particle mixing due to treatment with terrazyme.

Key Words: Terrazyme, Expansive soil, strength, dosage, bioenzyme

1. INTRODUCTION

Expansive soils, also called cracked soils, have a tendency to shrink and swell with varying levels of moisture content. As a result of this variability in the soil, severe stress occurs in the soil, followed by damage to the upper structures. In times of extreme humidity, like monsoons, the soil absorbs water, and it swells; after that, they soften and their water retention capacity decreases. In contrast, during the dry season, such as summer, the soil loses its moisture content due to evaporation, which in turn makes it even harder. Commonly found in the arid and semi-arid regions of the world, these types of soils are considered potential natural hazards - if left untreated, they can cause serious damage to the structures on which they are built, and cause loss of human health. The soil structure its composition, which includes the presence of montmorillonite, usually, reflects these structures. Calculated at billions of dollars a year worldwide, this soil has caused extensive damage to public engineering buildings.

2. TERRAZYME

Terrazyme is a liquid extract from sugar molasses that improves the engineering qualities of the soil like CBR values and density and decreases the OMC, plasticity index of soil. A replacement for metalling and soling for construction of roads, yards and parking lots. Terrazyme,

manufactured by Nature Plus Inc U.S is an excellent replacement for metalling and soling.

3. OBJECTIVE OF THE STUDY

- Study the impact of Terrazyme on the quality of primary and elementary subject classes and their impact on the footwork system.
- Improving the quantity of Terrazyme that will be used as a stabilizing agent and the degree of stabilization of strength over time.
- Develop appropriate specifications and recommendations for the emergence of estimates for its use in the underground layer.
- Assessing the purpose of reducing stretch and improving load carrying by adding supplements.
- Determining high soil moisture mixed with Terrazyme which provides high levels of CBR and UCS.
- Assessing the effect of Terrazyme on expanded soil properties using Atterberg boundaries, free flow, free flow index, free flow rate, integration and CBR.

4. MATERIALS

4.1 Expansive soil

As part of this investigation, expanded black cotton was collected in the fields of Adoni. The black cotton soil obtained thus obtained was transported to a research facility in sacks. A small amount of soil was taken, sifted through a 4.75 mm filter, weighed, and then dried.

4.2 Terrazyme

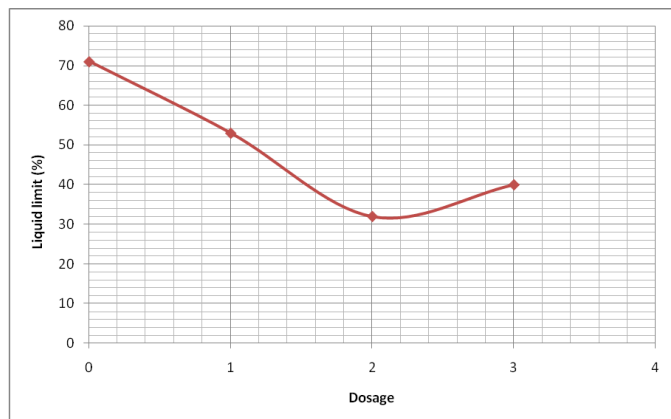
Terrazyme is a natural, non-toxic liquid derived from sugar cane. TerraZyme completely dissolves in water, brown in color and the smell of molasses. Its exact weight is similar to water and the pH range is between 4.3 and 4.6. It has a characteristic odor. Terrazyme is best stored at temperatures below 55 0C and above freezing. Enzymes facilitate the reaction between clay and living cat-ions ions and speed up the cat-ionic exchange process to reduce the thickness of the adsorbed layer. In some forms of chemical

reinforcement, chemicals are mixed with soil, which is difficult to mix well, but Bio-enzyme is easy to use as it can be mixed with water when there is high humidity and sprayed over the soil and compacted. Bio-Enzyme is produced in the USA by Nature Plus Inc.

5. RESULTS AND DISCUSSIONS

Table 4.1: Liquid limit test for expansive soil with and without terrazyme

Dosage	Liquid Limit (%)
Only soil	69
Soil+800ml/0.5m ³	52
Soil+1000ml/0.5m ³	29
Soil+1200ml/0.5m ³	42



Liquid limit of expansive soil is 71% without treating and after treating with Terrazyme it is decreased to 32%.

Table 4.4: Plastic limit test for expansive soil with and without terrazyme

Dosage	Plastic Limit (%)
Only soil	44.05
Soil+800ml/0.5m ³	31.9
Soil+1000ml/0.5m ³	16.60
Soil+1200ml/0.5m ³	21.72

Plastic limit of expansive soil is 44.53% without treating and after treating with Terrazyme it is decreased to 16.06%.

Table 4.6: Plasticity Index for expansive soil with and without terrazyme

Dosage	Plasticity Index (%)
Only soil	27
Soil+800ml/0.5m ³	22
Soil+1000ml/0.5m ³	16
Soil+1200ml/0.5m ³	16.9

Table 4.9: Shrinkage limit test for expansive soil with and without terrazyme

Dosage	Shrinkage Limit (%)
Only soil	21.7
Soil+800ml/0.5m ³	17.5
Soil+1000ml/0.5m ³	5.10
Soil+1200ml/0.5m ³	5.01

5.1 CONCLUSIONS

Based on the results obtained and comparisons made in the present study, the following

Conclusions can be drawn:

- Bio Enzymes are non poisonous, organic and biodegradable in nature. The product formed after the application of Terrazyme is bio degradable in nature and the effect is permanent. Terrazyme eliminates the use of granular sub base and sub grade course.
- The MDD of local soil without Terrazyme was 1.568gm/cm³ and OMC to be 22.5%.
- The initial cost of using Terrazyme is high as compared to traditional approaches but the benefit of using Terrazyme is that the maintenance cost is zero , making this approach economically cost effective.
- The third dosage of enzyme is the optimum one because the consistency limits are reduced and the soaked CBR increased after curing period of four days.

- With increase in percentage of Terrazyme the unsoaked CBR value was increased from 2.31% to 5.39%. Percentage increase is 133.33%.
- It is found that the value of liquid limit decreases from 71% to 40% and the plastic limit also decreases from 44.53% to 21.9%
- The UCS value increases from 0.71 kg/cm² to 3.07 kg/cm². Percentage increase is 332.39%.
- Maximum dry density increases from 1.568 g/cm³ to 1.82 g/cm³ and Optimum moisture content decreases from 22.50% to 16.25%
- The initial cost of using Terrazyme is high as compared to traditional approaches but the benefit of using Terrazyme is that the maintenance cost is zero, making this approach economically cost effective

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