STABILIZATOIN OF BLACK COTTON SOIL BY USING GEOTEXTILE MATERIAL IN ROAD CONSRUCTION

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Abstract - *Geotextile material a newly emerging field in the civil engineering and other field i.e. road work, river canal work, drainage etc Considerable length of roads planned to be constructed in India under various programmes require construction over poor subgrade soils. The performance of a road largely depends on properties of the subgrade soil. One such subgrade soil often encountered is the black cotton (BC) soil. It is inorganic clay of medium to high compressibility, high shrinkage and swelling property, very hard when dry, but lose its strength completely when in wet condition. As a result of wetting and drying process, vertical movement takes place in the soil mass leading to failure of pavement, in the form of settlement, heavy depression, cracking and unevenness.in order to improve the stabilization of BC soil the geotextile material has a scope as reinforcement. The overview of various synthesis geotextile fibre used in road construction.*

Key Words: Key words:- black cotton soil, polypropylene fiber, polyethylene fiber, compaction test

1. INTRODUCTION

A developing country like India which has a large geographical area and population, demands vast infrastructure i.e. network of roads and buildings. Everywhere land is being utilized for various structures from ordinary house to sky scrapers, bridges to airports and from rural roads to expressways.

1.1 OBJECTIVES

1.To study the effect of the soil strength after the application of geotextile materials
2 To conduct the primary soil tests such as natural Proctor Compaction Test
3.To study the results drawn from above tests for the unreinforced and reinforced soil with different percentages like 1%, 2%, 3%, 4% & 5%.

3. METHODOLOGY

3.1 MATERIALS

3.1.1 Black Cotton Soil

Black soils are formed by lava basaltic rocks. Hence they are very dark in color. They develop cracks during dry period and swell if got moisture, hence they are self-tilling in nature, that's why they are fertile and can hold water for long time. This capacity is used for Cotton cultivation, hence they also called Regular Black Cotton Soil

3.1.2 High Density Polyethylene (HDPE)

Polyethylene (PE), also known as polyethene (IUPAC name) or polythene, is a major group of thermoplastic polymers, produced by the polymerization of ethylene. Depending on the polymerization process used, various types of polyethylene with differing properties can be obtained.

3.1.3Polypropylene

Polypropylene (PP), also known as polypropene, is a thermoplastic polymer used in a wide variety of applications. It is produced via chain-growth polymerization from the monomer propylene.

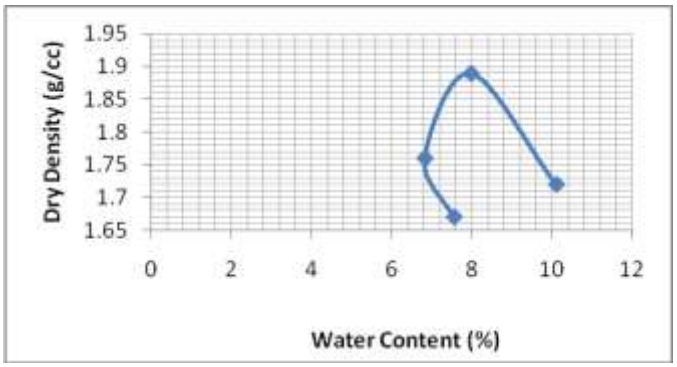
4. IMPLEMENTATION

4.1 COMPACTION TEST

The Modified Proctor's Test have been conducted for the determination of the Optimum Moisture Content (w) and Maximum Dry Density (Yd(max)) of the plain (Table-4.1) as well as reinforced soil (Table-4.2) by compacting the soil samples manually.

Table 4.1: Data for OMC-MDD of Plain Soil Samples.

Sample No.	Dry Density (g/cc)	Water Content (%)
1	1.67	7.56
2	1.76	6.83
3	1.89	7.98
4	1.72	10.11

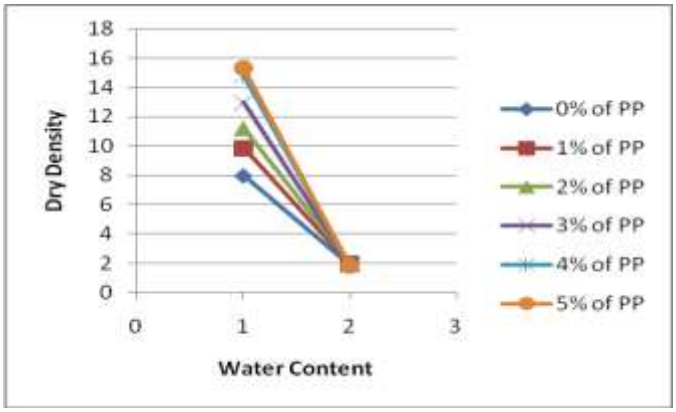


Soil reinforced with Polypropylene

The maximum dry density of the plain soil has been found as 1.89g/cc at 7.98% of optimum moisture content from the curve drawn in fig. 4.1 and tabulated given in Table 4.1.

Table 4.2: Data of OMC – MDD for the Soil Reinforced with Polypropylene

Length of PP	Percentage of PP with soil (%)	Dry Density (g/cc)	Water Content (%)
3mm	0	1.89	7.98
	1	1.97	9.89
	2	2.05	11.23
	3	1.93	12.98
	4	1.86	14.87
	5	1.82	15.36



Graph 4.2: OMC – MDD Curve for Soil Sample reinforced with Polypropelene

The maximum dry density of the soil reinforced with different percentages of PP at 3 mm length has been found from the curve drawn in fig.4.2 and are tabulated given below in Table 4.2.

Do not use abbreviations in the title or heads unless they are unavoidable.

Soil reinforced with Polyethylene (HDPE)

Table 4.3: Data of OMC – MDD for the Soil Reinforced with Polyethylene

Percentage HDPE added (%)	Maximum dry density (g/cm³)	Optimum Moisture Content (%)
Unreinforced Soil	1.89	7.98
1	1.91	12.56
2	1.98	15.92
3	2.21	14.83
4	3.15	16.41
5	1.88	11.32

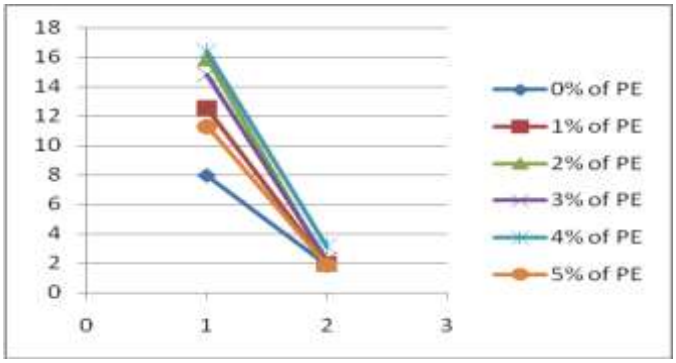


Fig -1: Name of the figure

Soil samples were air dried and pulverized and those passing through IS 20 mm sieve were used for the test. Light compaction test was conducted on unreinforced soil and in six samples of reinforced soil with 1%, 2%, 3%, 4% and 5% of HDPE respectively. The results so obtained are shown in Table 4.3. The water content vs. dry density curves for all the samples are shown in Figure 4.3.

Unreinforced Black Cotton soil showed optimum moisture content of 7.98% and a maximum dry density of 1.89g/cm^3. It was observed that addition of HDPE strips increased the maximum dry density, with the optimum value being at 4% HDPE. Optimum moisture content was observed to be decreasing with increasing percentages of HDPE with the optimum value being at 4% HDPE

3. CONCLUSIONS

In this study it is evident that geotextile soil techniques enchances the strength properties of the well designed earthern structures. This is being proved in this study conducting tests in poor soil. For road construction, the strength of the soil can be improve by means of reinforcement geotextile material.

BC SOIL REINFORCED WITH POLYPROPYLENE (PP)

i. Maximum dry density of the soil sample increased with increasing percentages of PP strips, optimum value being that at 2% PP.
ii. The Optimum moisture content decreased with increasing percentages of PP. The optimum value was obtained at 2% PP. At 2% PP, the Optimum moisture content obtained was about double as that of unreinforced soil.

BC SOIL REINFORCED WITH HIGH DENSITY POLYETHYLENE (HDPE)

i. Maximum dry density of the soil sample increased with increasing percentages of HDPE strips, optimum value being that at 4% HDPE.
ii. The Optimum moisture content decreased with increasing percentages of HDPE. The optimum value was obtained at 4% HDPE. At 4% HDPE, the Optimum moisture content obtained was about double as that of unreinforced soil.

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