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Experimental Investigation of Black Cotton and Sandy Soil using Geogrid as Soil Reinforcement

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Abstract: Subgrade soil and its properties are important for life of the pavement. Some time stabilization technique is adopted in order to strengthen the weaker subgrade soil. During recent past, utilization of Geogrid has increased for improving the strength characteristics of subgrade soil. In the present study an attempt has been made using geogrid as reinforcement to improve the properties of two types of soils viz. black cotton and sandy soil. CBR tests were carried out for both the soils, by placing geogrid at different levels. Results indicate that strength of soils increased by placing geogrid and it is found that geogrid placed at 40%H distance from the top showed highest result than 20%H, 60%H and 80%H. observed that sandy soil with geogrid showed significant improvement in strength than black cotton soil.
Keywords: Geogrid, Sub grade, Reinforcement, Stabilization

I. INTRODUCTION

Quality and durability of pavements depends upon characteristics of sub grade soil because the entire pavement is supported by sub grade soil. The construction of pavement becomes more challenging for highway engineers where the soil is weak and this can be replaced by borrow soil, but it leads to increase in construction cost due to transportation. Stabilization is an alternative technique which improves the properties of soil.

Geogrid is one of the geo synthetic materials which is used to improve the properties of soil and widely used as reinforcement in structures like pavements, embankments retaining walls, slopes etc. it is an effective in tension, where the soil gets pull out under tension.

II. OBJECTIVE AND SCOPE OF PRESENT WORK

Main objective is to enhance the properties of two types of soils using reinforcement technique

1) To assess the index properties and compaction properties of two soils
2) To determine the change in strength characteristics of the unreinforced and reinforced soil specimen by CBR after 4 days of soaking
3) Improve the strength of soils using geogrid reinforcement
4) Finding optimum position of geogrid placed in CBR mould which would give maximum strength.

III. MATERIAL PROPERTIES

During this method of stabilization all the basic laboratory tests were conducted on the both the soils and CBR was tested on unreinforced and reinforced soil specimens.

Biaxial polyester geogrid was used which is sourced from Reno agro and Engg pvt ltd .Coimbatore shown in fig 1

TABLE I: PHYSICAL PROPERTIES OF SOILS

Property	Black cotton soil	Sandy soil
Liquid limit %	65.5	32.4
Plastic limit %	38.7	21.3
Plasticity index%	26.8	11.1
Is classification	CH	SC
Maximum dry density (g/cc)	1.64	2.1
Optimum moisture content%	20.8	9.8

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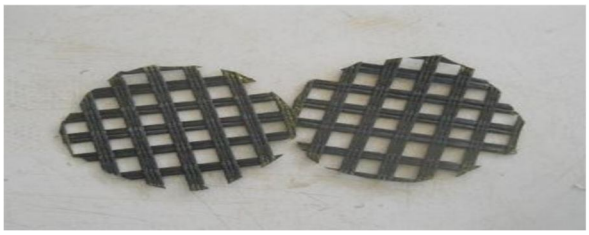

Fig: 1 Geogrid material cut in circular disc for placing in CBR mould

TABLE II: Physical Properties Of Geogrid

Property	Specification
Material composition	Polyester
Mesh aperture size (mm)	18X18
Thickness(mm)	2
Tensile strength (Kn/m) wrap –wise	100
Tensile strength across wrap	100
Mass per unit ,g/Sqm	450
Elongation (%)	15
Coating(%)	20
Rolling width(m)	2.5
Rolling length(m)	50

IV. EXPEREMENTAL PROCEDURE

1) Required material was weighed and obtained optimum moisture content is added to prepare specimen.
2) CBR mould was placed on base plate with collar attached.
3) Soil was divided into five parts and placed into CBR mould.
4) Soil was placed in 5 layers and each layer was compacted by giving 56 blows each from 4.89 kg of rammer with free fall of 450mm.
5) Geogrid is placed above the compacted layer depending upon the choice of position; it may be 20%, 30%, 40% 60% and 80% from top surface.
6) Position of geogrid placed in CBR mould shown in fig 2.
7) CBR moulds were kept for 4-days of soaking.
8) Similar procedure is followed for all other position.

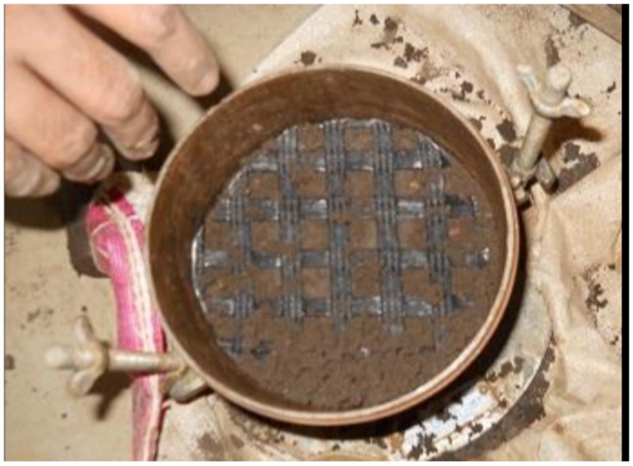

Fig:2 Geogrid material placed into CBR mould

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TABLE III:
CBR Test Results Of BC Soil With And Without Reinforcement

Sl no	Position of reinforcement from top of specimen	CBR(%)
1	No reinforcement	1.4
2	20%H	2.1
3	40%H	2.2
4	60%H	2.0
5	80%H	1.9

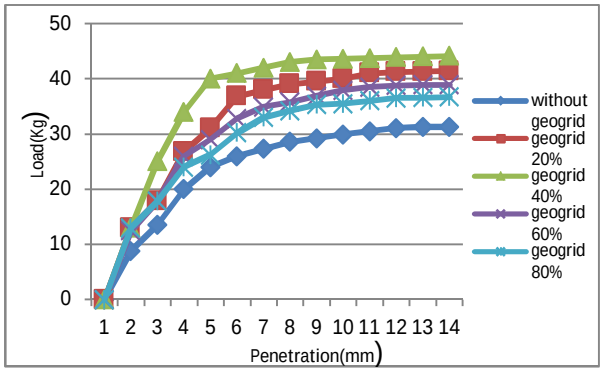

Fig 3:CBR curve BC soil with and without geogrid

TABLE IV:
CBR TEST RESULTS OF SANDY SOIL WITH AND WITHOUT REINFORCEMENT

Sl no	Position of reinforcement from top of specimen	CBR(%)
1	No reinforcement	6.8
2	20%H	9.9
3	40%H	10.5
4	60%H	7.3
5	80%H	7.1

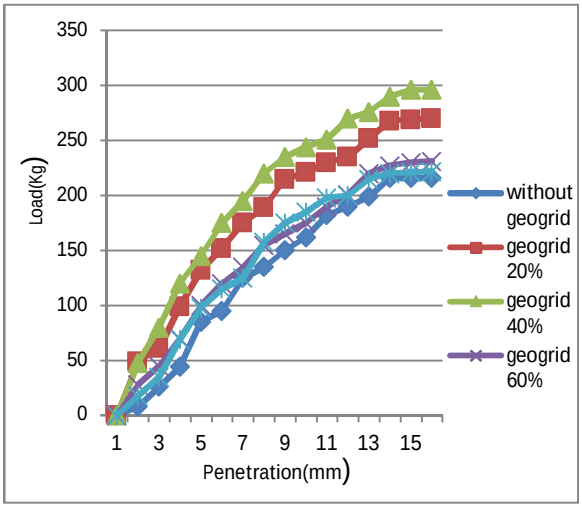

Fig 4:CBR curve of sandy soil with and without geogrid

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V. DISCUSSION AND CONCLUSION

Results obtained in this study shows that the placing of geogrid in soils has significant improvement in strength.

1) Insertion of Geogrid considerably increases the CBR value of both the soils when placed at different position, Maximum strength obtained for 40%H position from top surface

2) CBR value of sandy soil is 6.8% which increased to maximum 10.5% at 40%H of geogrid position within soil specimen ,which is considered to be the optimum position of geogrid

3) Geogrid reinforcement is much effective in subgarde stabilization which increases bearing capacity. Thus improves the life of the pavements with economical construction.

4)

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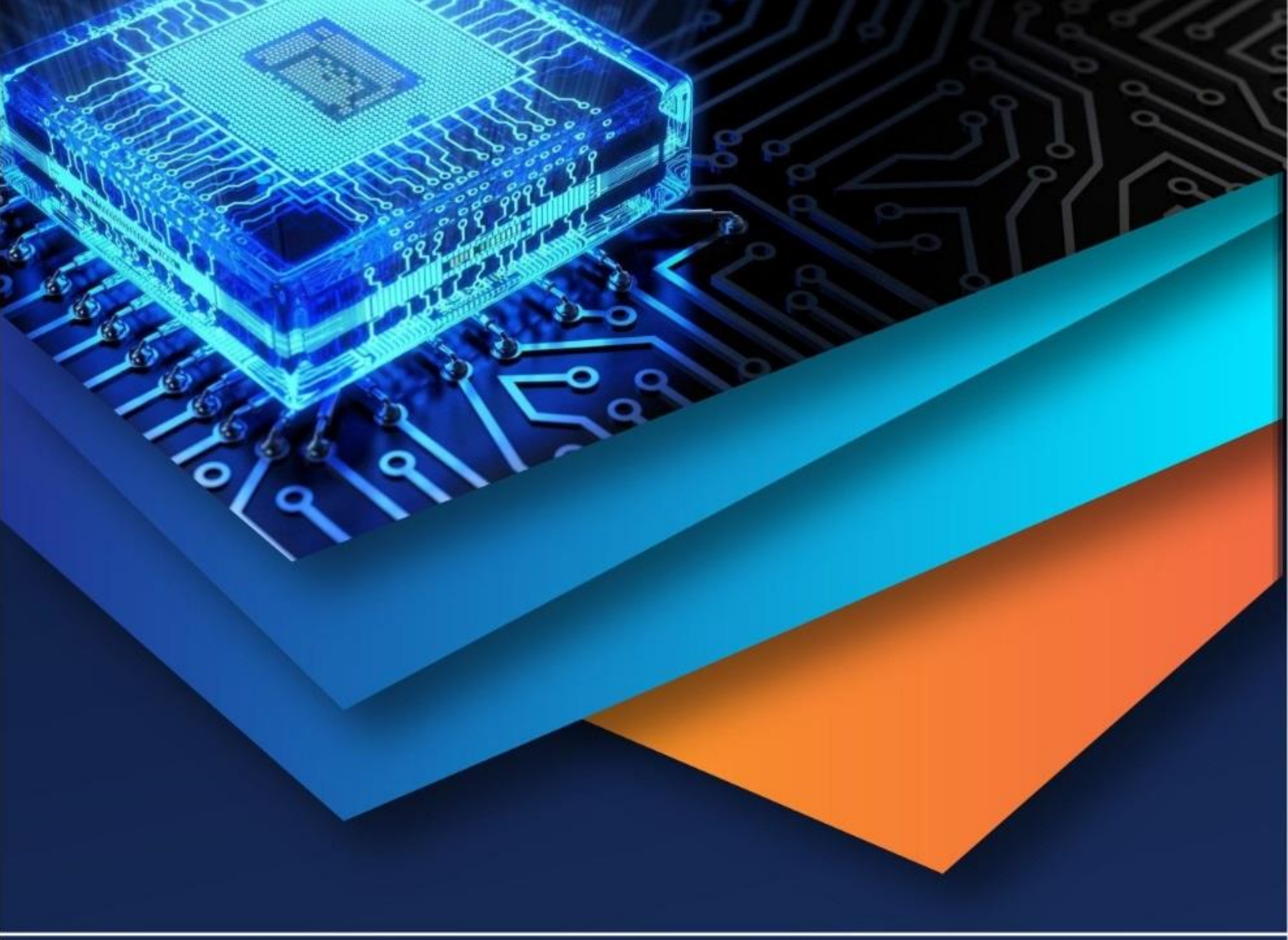

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