© 2016 IJSRST | Volume 2 | Issue 6 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X
Themed Section: Science and Technology

California Bearing Ratio Analysis of Soaked Soil Sample Reinforced with Geotextile FIBRE

Saman Khan[1], Roohul Abad Khan[2], Amadur Rahman Khan[3]
[1]Integral University, Lucknow, India
[2]King Khalid University, Saudi Arabia
[3]Aligarh Muslim University, India

ABSTRACT

The advantage of reinforced soil in form of economy, ease of construction has resulted in extensive use of Reinforced soil in geotechnical engineering design and construction. This paper evaluates the effect of geotextile reinforcement on CBR value of soil. A total of 8 samples reinforced with varying degree and positon of geotextile fibre layer in soil were tested to determine the CBR value. One soil sample with no geotextile fibre content was also tested to determine the changes in CBR value due to geotextile fibre reinforcement. The CBR value was determined at two penetration depth namely 2mm and 5mm. the results obtained depicted that the soil samples consisting 3 layers of geotextile fibre resulted in highest CBR value.

Keywords: Reinforced Soil, Economy, Geotechnical, Geotextile, CBR

I. INTRODUCTION

In many parts of the world frictional fills are difficult to obtain at economic rates and consequently the use of reinforced soil in these areas is curtailed. In many cases poor quality on-site soils are available. If these could be shown to be adequate for reinforced fill the requirement for expensive imported cohesion less soil could be eliminated and greater use could be made of reinforced soil.

There is a lack of information and understating concerning the relative improvement of the physical properties of a cohesive soil when used in construction with an appropriate geosynthetics used to provide drainage. Similarly, there is a lack of information of the mechanisms of action of geosynthetics materials used as reinforcement for cohesive soils.

II. METHODS AND MATERIAL

A. Materials Used

Cohesive soil

Clay minerals generally occur in the form of platy particles. The most important property of a clay soil is its plasticity. These is the ability of clay to take up water and for the clay water mass at its optimum consistency to be shaped and to hold that shape after forming forces are removed.

The shear strength behaviour of a clay soil is determined by its consolidation and stress history rather than its density as in the case of cohesion less materials. Most clay soils derive their shear strength from cohesion and friction; however, saturated clays may appear to possess cohesion only and are therefore referred to as "cohesive soils"

B. Geosynthetics used in the Research

A nonwoven geotextile developed by **DuPont™** (manufacturer) was considered for use in the study. DuPont™ Typar® SF is a thin, thermally bonded, water permeable nonwoven geotextile made of 100% continuous polypropylene filaments. It is designed to have a combination of a high initial modulus (stiffness), high elongation (typically> 50%) and outstanding uniformity, to give superior performance, to make it resistant to damage and to have excellent filtration properties. DuPont™ Typar® SF is an isotropic material, which means that its physical properties are the same in all directions. This mirrors the stresses and strains of a typical separation application.

Furthermore, the fact that DuPont™Typar® SF is made of 100% polypropylene, makes it resistant to rotting, moisture and chemical attack, particularly alkalis.

Methodology

C. C.B.R. TESTS

A number of California bearing test (C.B.R.) were carried out to determine the angle of internal friction cohesion of the Clay soil while containing Non –woven Geotextile with various position. The Sample On which the series of the tests were conducted is as follows:

i- Sample with No Geotextile layer (from Here and after in this Thesis such Soil Sample referred and write as OG00).

ii- Samples with 1 layer of geotextile with Different position in various sample i.e. Single Layer in Upper 1/3rd region, Single Layer in Middle 1/3rd region and Single Layer in Bottom 1/3rd region (from Here and after in this Thesis such Soil Sample referred and written as 1G0U, 1G0Land 1G0M respectively).

iii- Samples with 2 layer of geotextile with Different position in various sample i.e. One Layer in Upper 1/3rd region and One Layer in Middle 1/3rd region, One Layer in Upper 1/3rd region and One Layer in Bottom 1/3rd region, One Layer in bottom 1/3rd region and One Layer in Middle 1/3rd region (from Here and after in this Thesis such Soil Sample referred and write as 2GUM,2GUL and 2GML respectively).

iv- Samples with 3 layer of geotextile with Different position in various sample i.e. One Layer in Upper 1/3rd region, One Layer in bottom 1/3rd region and One Layer in Middle 1/3rd region (Such Soil Sample referred and written as 3G00).

C.B.R.is expressed in percentage of force per unit area required to penetrate a soil mass with a circular plunger of 50 mm diameter at the rate of 1.25 mm/minute to that required for corresponding penetration of 2.5 mm and 5.0 mm. where the ratio at 5 mm is consistently higher than that at 2.5 mm, the ratio at 5 mm is used.

All tests were conducted on the sample prepared in the laboratory according to the IS 2720(part 16):1987.

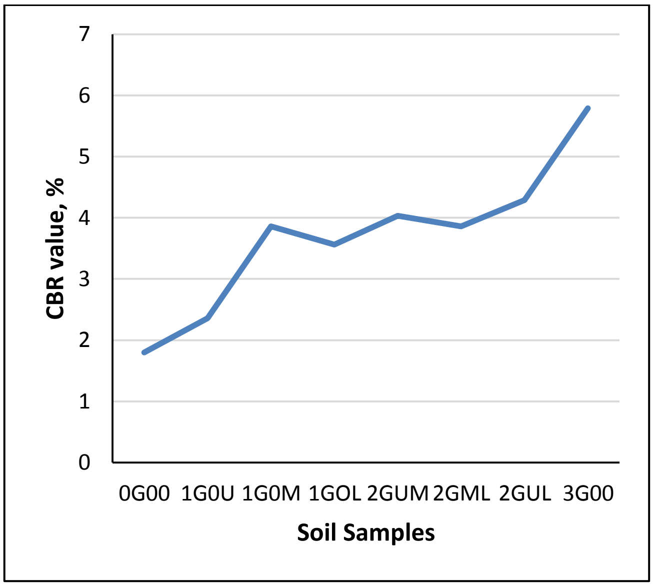

Figure 1. CBR values of soaked soil samples at 2 mm penetration depth

The figure 1 represents the CBR values at 2mm penetration. The geotextile fibre reinforced soil samples resulted in higher values of CBR than the sample with no geotextile fibre (0G00). The maximum CBR value for geotextile reinforced soil sample was depicted by 3G00 sample with the value of 5.79 while minimum was depicted by 1G0U sample with the value of 2.36.

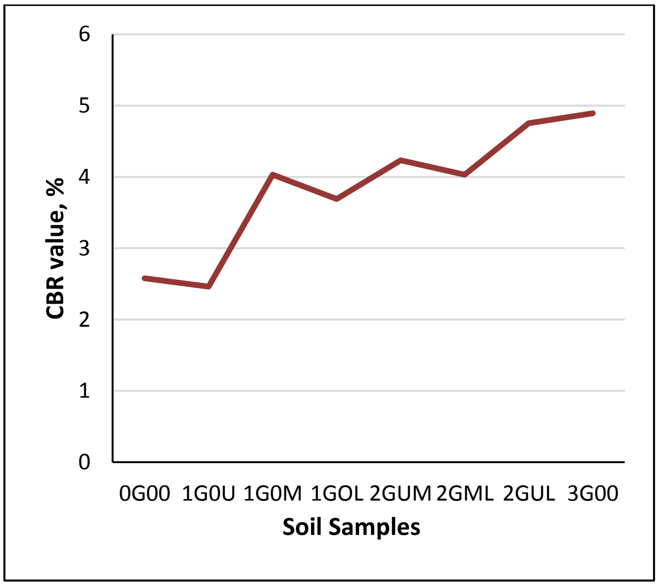

Figure 2. CBR values of soaked soil samples at 5 mm penetration depth

The figure 2 represents the CBR values at 5 mm penetration. The geotextile fibre reinforced soil samples resulted in higher values of CBR than the sample with no geotextile fibre (0G00). The maximum CBR value for geotextile reinforced soil sample was depicted by 3G00 sample with the value of 4.89 while minimum was depicted by 1G0U sample with the value of 2.46 which was even less than the no fibre soil sample value of 2.58.

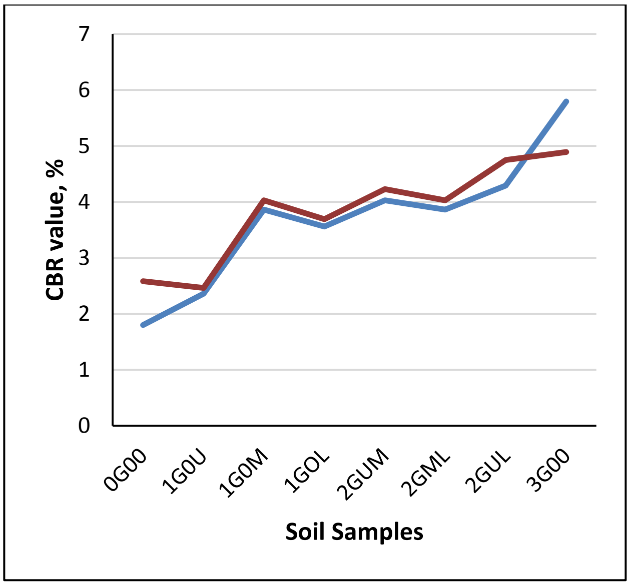

Figure 3. CBR values of soaked soil samples at 2 mm and 5 mm penetration depth

The figure 3 represents the comparative graph of CBR value at 2mm and 5 mm penetration depth. The CBR value for zero fibre soil sample was found to be 1.8 and 2.58 for 2mm and 5mm depth respectively. The CBR values for all other samples except for 3G00 was found to be higher in case of 5 mm depth with respect to 2mm penetration depth.

III. CONCLUSION

Addition of geotextile fibres increases the CBR value of soil. The CBR value varies with depth of penetration. In single layer soil sample the maximum CBR value was depicted in the samples with geotextile fibre in Bottom (1G0M). At both the penetration depth of 2mm and 5 mm CBR value was found to be maximum in soil samples with 3 layer (3G00) of geotextile fibre. The 5 mm penetration depth resulted in higher CBR values in single layer and double layer of geotextile fibre samples. While the soil sample with 3 layer of geotextile fibre resulted in higher CBR values at 2mm penetration depth. Hence the incorporation of geotextile fibre in soil does enhance its CBR value to render it more useful.

IV. REFERENCES

[1]. Roohul Abad Khan, Amadur Rahman Khan and Shashank Verma," Effect of Fibre Content on CBR for Unsoaked RDFS," International Journal for Research & Development in Technology, Volume-5 issue-3 March 2016. Available Online at: http://ijrdt.org/full_paper/326/14/Effect-of-Fibre-Content-on-CBR-for-Unsoaked-RDFS

[2]. Roohul Abad Khan, Amadur Rahman Khan and Saiful Islam," Analysis of Dry Unit Weight and optimum moisture content," American International Journal of Research in Formal, Applied and Natural Sciences, ISSN (Print) 2328-3777, ISSN (Online): 2328-3785, March 2016. Available Online at: http://iasir.net/AIJRFANSpapers/AIJRFANS15-523.pdf

[3]. Roohul Abad Khan, Amadur Rahman Khan and Saiful Islam," Behaviour of CBR for Soaked RDFS at varying fibre length," e-ISSN: 2394-3343, p-ISSN: 2394-5494, International Journal of Innovative and Emerging Research in Engineering, Volume 3, Issue 2, 2016. Available Online at: http://ijiere.com/FinalPaper/FinalPaperBehaviour%20of%20CBR%20for%20Soaked%20RDFS%20at%20varying%20fibre%20length170540.pdf

[4]. Roohul Abad Khan, Amadur Rahman Khan, Saman Khan and Saiful Islam," Analysis of California bearing Ratio under soaked condition for RDFS," International Journnal of Engineering Research Online, Vol. 4 Issue 1 (Jan-Feb) 2016, ISSN: 2321-7758, Available Online at: http://ijoer.in/4.1.16/69-72%20ROOHUL%20ABAD%20KHAN.pdf

[5]. Roohul Abad Khan, Amadur Rahman Khan, Shashank Verma and Saiful Islam, "California Bearing Ratio Analysis for RDFS in Unsoaked Condition," International Journal for Research in Technological Studies, ISSN (Online): 2348-1439 Vol. 3, Issue 3, February 2016. Available Online at: http://www.ijrts.com/Vol3Issue3.php

[6]. Roohul Abad Khan, Amadur Rahman Khan, Saiful Islam and Shashank Verma," Behaviour of

Randomly Distributed Fibre Soil in consolidated undrained condition," International Journal of Advanced Research in Science, Engineering and Technology, Volume 3 Issue 2 2016. Available Online at: http://www.ijarset.com/currentissue.html

[7]. Saman Khan, Roohul Abad Khan, Saiful Islam and Amadur Rahman Khan," Interrelationship of PPFRC," International Journal of Research in Advent Technology ISSN: 2321-9637, Vol. 3 No. 4 March 2016, pp. 24-29. Available Online at: http://www.ijrat.org/downloads/Vol-4/march-2016/paper%20ID-42201624.pdf

[8]. Roohul Abad Khan, Amadur Rahman Khan, Saman Khan & Saiful Islam," Analysis of California Bearing Ratio under soaked condition for RDFS," International Journal of Engineering Research-Online, ISSN: 2321-7758, Vol. 4 Issue 1 Jan-Feb, 2016, pp.69-72. Available Online at: http://www.ijoer.in/4.1.16/69-72%20ROOHUL%20ABAD%20KHAN.pdf