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A STUDY BEHAVIOR OF CLAYEY SOIL USING SODIUM CHLORIDE AND COIR FIBER.

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Abstract: To be suitable for construction, soil with low bearing and shearing strength must be stabilized. Soils have low tensile and shear strength in general, and their characteristics are heavily influenced by environmental factors. Soil reinforcement is the process of incorporating certain materials with desired properties into soil that lacks them. Soil reinforcement is defined as a technique for improving the soil's engineering characteristics. Manufacturing wastes were successfully used in soil reinforcement techniques in the past, according to some studies. Mechanical, thermal, and chemical methods can all be used to change the properties of clayey soils. As a result, soil stabilization techniques are required to ensure that soil is stable enough to support the load of the superstructure, particularly in the case of highly active soil; they also save time.

Keywords: Soil stabilization, coir fiber, Sodium Chloride , MDD, OMC , UCS and CBR

1. INTRODUCTION

Engineers view soil as a complicated substance generated by the weathering of solid rock. Apart from its very complicated nature, it is the sole inexpensive and conveniently accessible material for construction needs. We cannot assess soil behavior appropriately in varied settings since the soil is a naturally available resource. Soil properties vary according to terrain and location. The same type of soil might behave differently in two unique settings. The role of a Geotechnical Engineer becomes considerably more critical here, as he must determine whether the present soil can bear the load arising from the superstructure or net. Because of the differences in soil behavior, we face the following issues:

• Because the relationship between stress and strain is not straight, no substantial elasticity theory can be developed.

• Because some parameters such as drainage, pressure, and moisture conditions have a strong impact on the strength component and behavior of soil, these aspects play a significant role when working with soil.

• Variation in soil characteristics from one location to another, as well as changes in soil properties. It is difficult to clarify the results of soil tests.

II Literature Review

- **Sandeep Kumar Namburu(2020):**This study was undertaken to improve the properties of soil by adding coir fiber in the ratio of 5% to 25% of the weight of soil. It was seen that the soil strength was improved and it kept increasing up to a percentage of 15% after that the strength properties were reduced.
- **Vivi Anggraini (2016)**: This paper reviewed the potential of using coir fiber as soil reinforcement. Several things were considered in choosing natural fibers as soil reinforcement, such as their availability, structural properties and low cost. Coir fiber (0.5 to 2%) was added to the soil. This addition increased various properties of soil as the tensile strength of the soil, ductility and modulus of elasticity. Direct shear test, unconfined compression test etc. have shown that mechanical properties and shear strength increases with increase in the addition of coir fiber.
- **H.P.Singh(2013)** studied the effect of coir fiber on the properties of soil. The coir fiber was taken as 0.25%,0.5%,0.75% and 1% by dry weight of soil. It was observed that on increasing the fiber content the values of all the strength parameters increases and the maximum improvement was found at 1%.The strength parameters and stiffness module of the soil with fiber was compared with the soil having no fiber which showed that properties were improved to a large extent.
- **Ghavami et al. (1999)** found that addition of 4% coconut fiber gave noteworthy malleability and fairly extended the compressive quality.

III Material and Methodology

3.1 Soil sample:

This soil is taken from the flood channels tengpora in the Srinagar district of Jammu and Kashmir. tests are conducted in this soil according to the IS Code.

3.2 Coir Fiber

Coir fibre was collected from the Lal chowk area of Srinagar .length used was 6 mm and diameter taken was 16 micron.

Table 1: Physical properties of Coir Fiber

Property	value
Ultimate length	6 mm
Diameter/width	16 microns

3.3 Sodium Chloride

Sodium chloride was taken from the Maisuma area of Srinagar of district Jammu and Kashmir. Sodium chloride content was varied from 0% to 10% of the weight of dry soil.

Table 2 Properties of Sodium Chloride

Property	Value
Melting point	801^0C
Boiling point	1461^0C(1013)
Vapour pressure(865^0C)	1.3hpa
Specific gravity	2.165

3.4 Methodology Adopted

- A series of tests were done in which the coir fiber was varied by 0.25% to evaluate the effect of coir fiber as a stabilizing ingredient in soils. Then test was done in which the sodium chloride was varied by 2% to again evaluate the effect of sodium chloride on the soil and coir fiber was kept constant at its optimum value. There were different percentages of 0.00%, 0.25%, 0.50%, 0.75%, 1.00% of coir fiber and 0.00%, 2.00%, 4.00%, 6.00%, 8.00% of sodium chloride taken by weight. Initially coir fiber was varied by 0.25%, then coir fiber was kept constant and sodium chloride was varied. The following experiments were carried out according to Indian standard codes:
- Unconfined Compressive strength (UCS) test – IS: 2720 (Part 10)-1991
- California Bearing Ratio (CBR) Test -IS: 2720 (Part 16) – 1987
- Liquid and plastic Limit – IS:2720 (Part 5) – 1985
- Compaction Test (IS-2720-PART-7-1980)

3.5 Sample Preparation

The site is located at tengpora [flood spill channel], within Srinagar District of Kashmir Valley, which predominantly comprises of old alluvium up to large depths. The sub-soil strata at such location can broadly be categorized under natural alluvium/ water laid deposits (Alluvial/Flood Outwash Deposits), which generally include silty-clay or clayey-silt associated with matrix of highly decomposed organic silts/peat/trapped partially decomposed fibrous organic matter etc. The proposed site has very close proximity of major watercourse (River Jhelum), approximately 4.4 km.The was collected from tengpora flood spill channel [Srinagar]. In the collection of soil samples, top layer of soil was removed up to the depth of 20 cm. The soil was dug with the help of spade and samples were collected in air tight containers with the help of trowel and were further transported to the place of investigation [laboratory]

III Results and Discussion

Properties of virgin soil

Property	Value
Liquid Limit	34
Plastic Limit	21
PI	13
Specific Gravity	2.55
MDD(G/CC)	1.68
OMC (%)	10.7
UCS ($kg/cm^{2)}$	0.55
CBR Unsoaked (%)	1.57

3.1 Compaction characteristic of soil

Compaction may be described as the method of mechanically increasing the density of soil. Solid particles and voids make up soil.

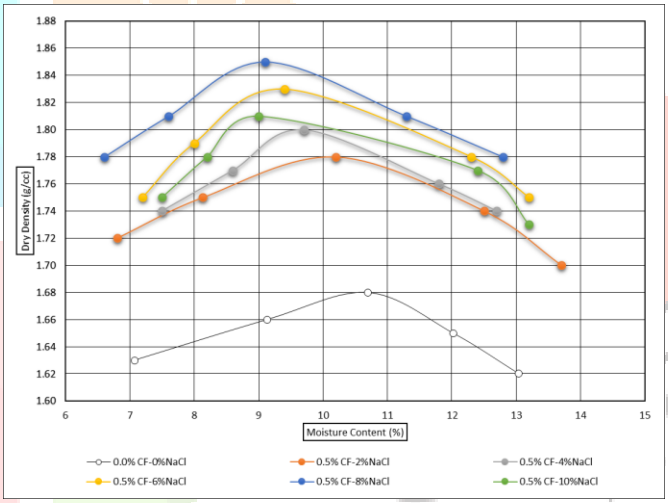

Fig 1 Compaction curve for different sodium chloride content and constant coir fibre

3.2 Unconfined Compressive Strength

The Unconfined compression test is a laboratory test which is used to derive the unconfined compressive strength (UCS) of a soil specimen

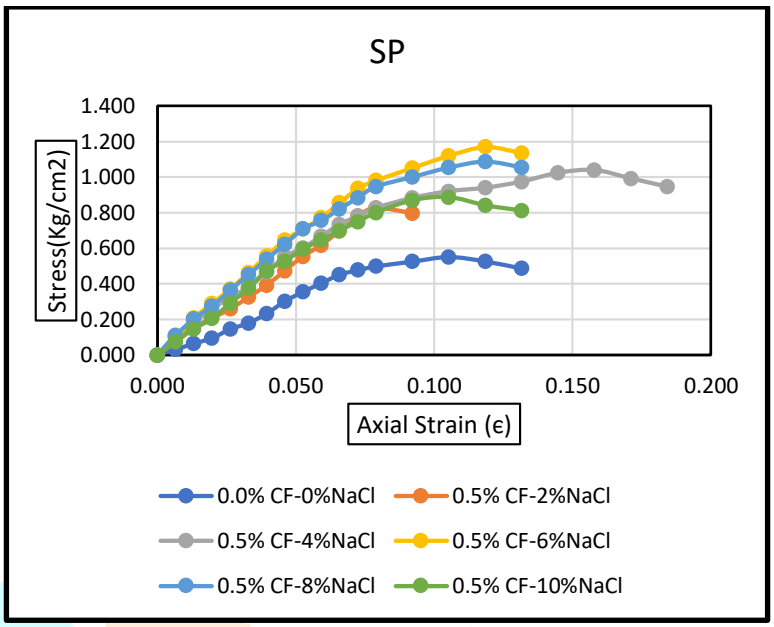

Fig. 2: Stress Strain Relationship of Soil: 0.5%Ccoir fiber:NaCl

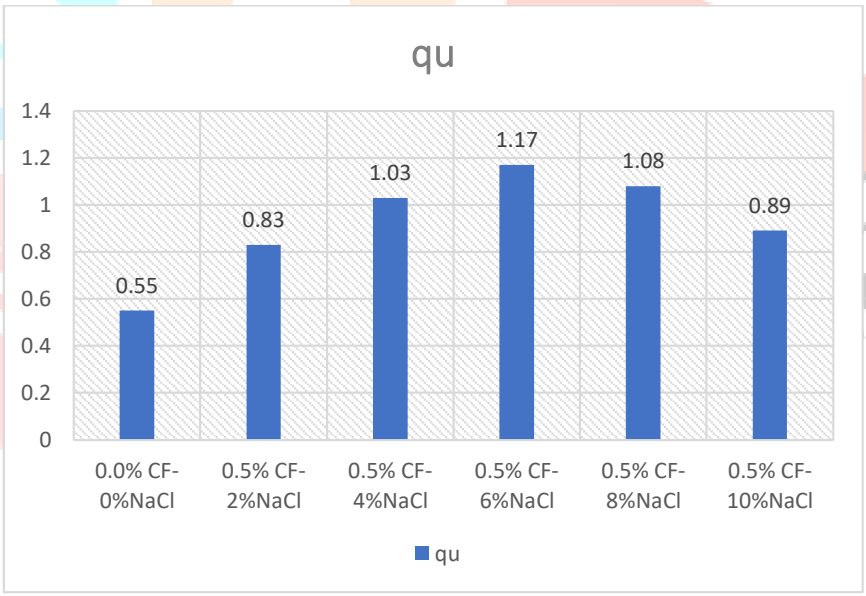

Fig. 3: Variation of UCS of Soil:0.5% CF:NaCL

3.3 California bearing ratio

CBR testing for clay soils was conducted in the laboratory in unsoaked conditions according to Indian regulations. Because the shape of the load penetration curve in CBR tests is subject to bedding error, efforts were taken to reduce it by meticulously prepping the sample's surface.

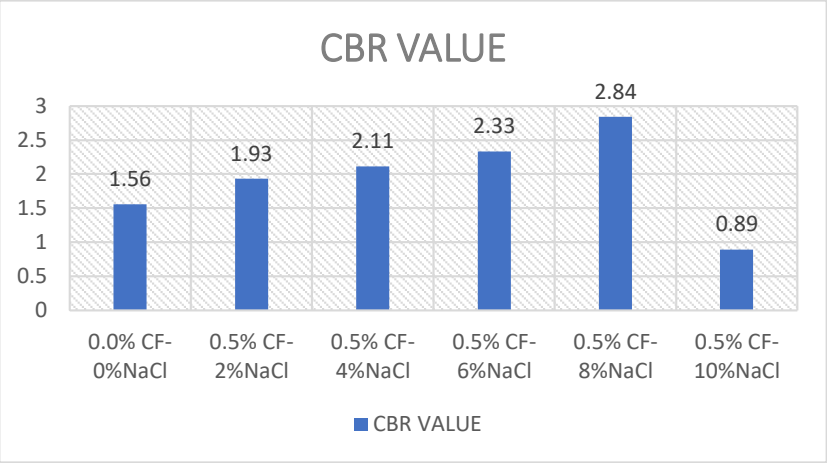

Fig. 4: Variation of CBR with Different % of Sodium Chloride and 0.5% Coir Fiber.

The CBR test was done to the soil and sodium chloride was added and coir fiber was kept constant at 0.5% coir fiber and it was found that the value of CBR increased from 1.56 to 2.84%. The maximum value was found at 0.5% coir fiber and 8% sodium chloride.After 8% sodium chloride,the value of CBR decreased and reached to a minimum value of 2.52% at 10% sodium chloride.

IV CONCLUSIONS

- The maximum dry density of virgin soil was found to be 1.68 g/cc and optimum water content was 10.7%.
- On adding coir fiber, it was found that MDD increases from 1.68 to 1.74 g/cc at a percentage of 0.5% after which it decreased as the specific gravity of coir fiber is less than the soil.
- MDD was found to increase from 1.68g/cc to 1.85 g/cc with addition of sodium chloride, keeping coir fiber percentage constant and the optimum value was found at 8.00% sodium chloride.
- The unconfined compressive strength was found to increase from 0.55 to 1.17 kg/cm^2 at a percentage of 6% sodium chloride and 0.5% coir fibre.
- The CBR value increased from 1.56 to 2.84% and maximum CBR value was found at 8% sodium chloride content and 0.5% sodium chloride after which it started decreasing and the minimum value was found at 10% sodium chloride and 0.5% coir fiber which is 2.52%.

V REFERENCES

[1]. American Society for Testing and Materials (ASTM), ASTM D6951/D6951M – 09 *Standard Test Method for Use of the Dynamic Cone Penetrometer in Shallow Pavement Applications.*

[2] AI-Refeai, T.O. and Al-Ghamdy, *D. "Geological and Geotechnical Aspects of Saudi Arabia" Geotechnical and Geological Engineering,* 12 (1994), 253-276.

[3] Bandyopadhyay.K , Bhattacharjee.S-*"Comparative Study Between Laboratory and Field CBR by DCP and IS Method"- Indian Geotechnical Conference* – 2010, GEO trendz December 16-18, 2010 IGS Mumbai Chapter & IIT BOMBAY

[4] Chua, K.M., 1988, *"Determination of CBK and Plastic Modulus of Soils Using a Portable Pavement Dynamic Cone Penetrometer,"* Penetration Testing, pp. 407-4 14

[5] De Beer, M., and van der Merwe, C. J. (1991). *"Use of the Dynamic Cone Penetrometer (DCP) in the Design of Road Structures,"* Minnesota Department of Transportation, St. Paul, MN.