EFFECT OF BAMBOO FIBRE ON MARINE CLAY

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Abstract - *Construction of foundation for structures on marine clay is highly risky on geo-technical grounds because such soil is susceptible to differential settlements, poor shear strength and high compressibility. In recent days it has been investigated that addition of fibers will improve the ductility behaviour of the soil there by reducing the development of crack during shrinkage. This paper describes the compaction and strength behaviour of marine clay reinforced with bamboo fibers. The objectives of the present study is to determine the reinforcing effect of randomly distributed, discrete bamboo fibers on marine clay. Bamboo fiber used here is in crushed form. It is intended to randomly distribute bamboo fibre at five different percentages of fiber content, i.e. 0.25, 0.5, 0.75, 1 and 1.25% (by weight). The reinforced soil samples will be subjected to unconfined compression test and compaction tests.*

Key Words: **Marine clay1, Bamboo fiber2 Compaction3, Unconfined compressive strength4.**

1. INTRODUCTION

Most of the areas in Kerala have marine clay deposits. They are very weak soil deposits, with very high organic matter, hence unsuitable for any construction works. Improvement in the properties of these soils may make it suitable for various purposes especially for road pavements. Stabilized soils can be successfully used for the construction. Chemical stabilization is one of the oldest methods of stabilization of problematic soil. In recent days it has been investigated that addition of fibers will improve the ductility behaviour of the soil there by reducing the development of crack during shrinkage. Randomly oriented tensile inclusions incorporated into soil is to improve its load–deformation behaviour by interacting with the soil particles mechanically through surface friction and also by interlocking. One of the main advantage of randomly distributed fiber is that the maintenance of strength isotropy and absence of potential planes of weakness that can develop parallel to the oriented reinforcement.

2.Methodology:

2.1 Materials

The study was conducted on weak soil of high plasticity (CH) collected from Ernakulam. The properties of soil are given in Table 1.

Table -1: Properties of soil

Properties	Values
Specific Gravity	2.5
Natural moisture content (%)	55.2
Optimum moisture content (%)	32.3
Maximum dry density (g/cc)	1.53
Unconfined compressive strength (Kg/cm^2)	0.63
Liquid limit (%)	73.4
Plastic limit (%)	12.6
Shrinkage limit (%)	10.78
Plasticity index (%)	60.8
Percentage sand (%)	19.5
Percentage silt (%)	26.5
Percentage clay (%)	54
IS Classification	CH

Figure 1 : Marine clay

Bamboo fiber used in the study were collected from go green products .Bamboo fibre obtained is in crushed form. Properties of bamboo fibre are showm in table 3

Table 2 : Properties of bamboo fibre

Properties	Values
Elongation (%)	14
Fibre length (mm)	3 to 5
Moisture (%)	4.8
Break force (N)	6.1
Youngs Modulus (GPA)	14.2
Tensile strength(MPA)	180

Figure 2 :Bamboo fibre

3. Experimental/Analytical studies

3.1 Effect of fibre on compaction characteristics

Standard proctor test is conducted on marine clay by adding varying percentage of fibre. Fibre were added on 0.25%, 0.5%, 0.75%, 1% and 1.25% of the marine clay and its effect were analysed. Maximum dry density and optimum moisture content was obtained.

Table 3 : Variation of dry density

Fibre content (%)	Dry density (g/cm^3)
0	1.53
0.25	1.48
0.5	1.38
0.75	1.37
1	1.365
1.25	1.34

Table 4 : Variation of OMC

Fibre content (%)	OMC
0	32.3
0.25	32.45
0.5	32.5
0.75	33.33
1	33.56
1.25	34.5

The dry density is found to be decreasing as the percentage of fibre is increased and Optimum moisture content is increasing with increase infibre content

3.2 Effect of fibre on unconfined compressive strength

Uncofined compressive strength were conducted on marine clay by addition of varying percentage of fibre. Fibres were added on 0.25%, 0.5%, 0.75%, 1%, and 1.25% of the marine clay

The variation were tabulated in Table 5.

Table 5: Variation of UCS

Fibre content (%)	UCS(Kg/cm^2)
0	0.63
0.25	0.712
0.5	0.81
0.75	1.52
1	1.65
1.25	1.3

UCS value is found to be maximum at 1% addition of fibre on soil. Optimum value of bamboo fibre on marine clay is found to be 1%.

4. Results and Discussions

From the compaction characteristics it is clear that there is variation in property of the soil during fibre addition.The dry density is found to be decreasing with fibre addition and OMC is found to be increasing with fibre addition. The decrease in dry density can be attributed to the lower density of fibre compared to that of the soil. Increase in optimum moisture content is due to additional water being absorbed by the fibre.

Fibre addition on marine clay increase the UCS value .UCS value of soil reaches maximum during 1% addition of fibre and then decreases. Therefore the optimum percentage of bamboo fibre on marine clay is found to be 1%. The variation in dry density and OMC is shown in figure 3 and figure 4.

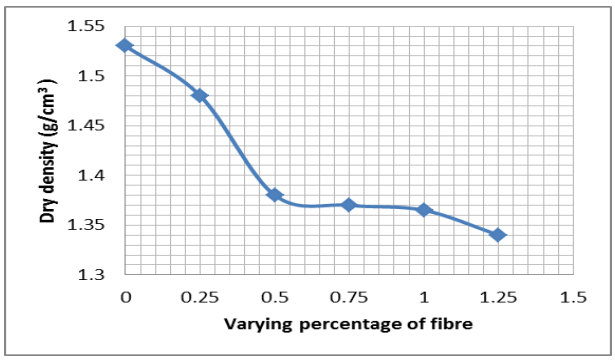

Figure 3 :Variation in dry density

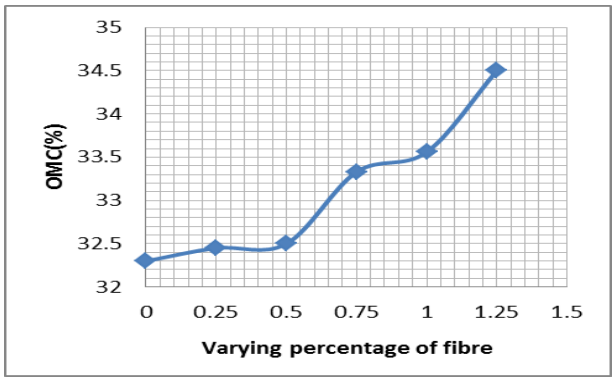

Figure 4 : Variation in OMC

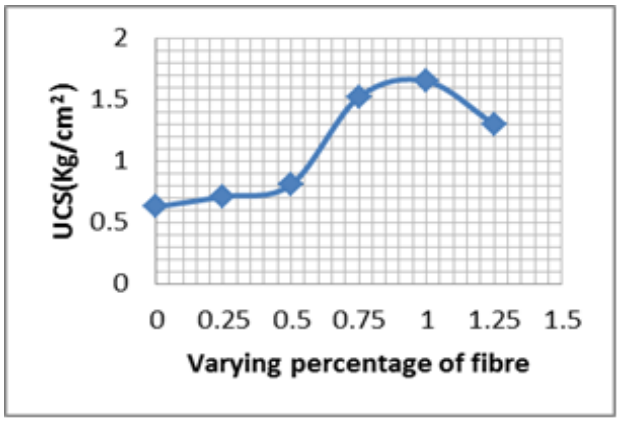

Figure 5 : Variation in UCS

5 Conclusions

Based on the above experimental investigation the following conclusions are arrived.

- As the fibre content increases dry density is decreased.
- The decrease in dry density can be attributed to the lower density of fibre compared to that of soil.
- As the fibre content increases OMC is found to be increased.
- The increase in OMC is due to additional water being absorbed by the fibre.
- The unconfined compressive strength increases upto 1% addition of bamboo fibre in marine clay and then decreases
- The optimum value of bamboo fibre on marine clay is 1%.

References

1) Arvind Kumar and Asheet Bajaj (2007), " Influence of flyash ,lime, polyester fibers on compaction and strength properties of expansive soil", journal of materials in civil engineering,vol:19,pp:242-248

2) Bindu Sebastian and Babu Jose (2010) , "Effect of coir fiber inclusion on shear strength of marine clay" ,Procedings of Indian geotechnical conference, pp:379-382

3) Dhanya P (2016) , "Effect of inclusion of bamboo fiber on geotechnical properties of quarry dust treated kuttanad soil, International journal of research in engineering and technology, vol:3(4) ,pp:76 -80

4) John Paul and Rachael (2016) , "Effect of random inclusion of bamboo fiber on strength behaviour of flyash treated black cotton soil" , International journal of civil engineering and technology, vol :7(5), pp: 153-160.

5) Ramesh and Manoj Krishna (2013), "Compaction and strength behaviour of lime-coir fiber treated black cotton soil", Geomechanical engineering, vol:2(1), pp:353-360