Stabilization of Soil using Geo-Jute

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***Abstract*: Soil stabilization has become the major issue in construction activity. In this project we focus on improvement of engineering properties of soil using Geo- Jute fiber. The aim of present investigation is to determine the Geo-Jute as a soil stabilizer. The emphasis depends upon the effective utilization of by product Geo- Jute with a view of decreasing the construction cost. It enhances the engineering properties in case of pavement and earthen slope. Jute fibers are usually strong with low extensibility. Moisture content in jute helps increase its frictional property. The results show the increment of soil properties like shear strength, dry density and permeability. The settlement decreased on introduction of jute geo-textile, indicating significant improvement in the engineering behavior.**

INTRODUCTION

Soil is considered as a complex material. Apart from the testing and classification of various types of soil, in order to determine the stability, physical properties, the problems related to foundation design construction, pavement design, design of embankments, excavation and deign of earth dams are necessary.

Thus the stability of the pavement is depends upon the stability of the subgrade and it is done with soil stabilization. In order to enhance the engineering properties, soil can be reinforced with jute fibre. Jute fibre is preferable because of its better durability, high tensile strength and capacity to withstand rotting and heat, porous texture which gives it good drainage and filtration properties. Moreover, jute is locally available, cheap, eco- friendly and biodegradable.

Reinforcing in soil masses increases its strength, bearing capacity and ductility; reduces settlement and inhibits lateral deformation.

Jute fibre Stabilized soils show greater extensibility and compressive strength and reduction on settlement.

The jute is biodegradable and has no environmental hazard. In this paper jute fibre is used with varying amount and their effect was analyzed on shear strength.

OBJECTIVES:

- Geo-jute or jute geotextile has many potential applications in civil construction works

. • The engineering properties of jute fabrics are suitable for separation, reinforcement, drainage and filtration functions and can be suitably used in overcoming geotechnical problems of weak soil.

- Applied research including performance evaluation of geo-jute applications are needed to highlight the beneficial uses of geo-jute in the field.

SCOPE OF THE PROJECT:

The soils are generally stabilized to increase their strength and durability to prevent erosion and dust formation in soils. The properties of soil vary a great deal at different places, and the soil stabilization depends on soil testing.

In this project soil stabilization has been done with the help 0f Geo-jute. The jute fibres swell on absorption of water. The jute is not thermoplastic like other natural fibre. Due to high specific heat, the jute possesses a thermal insulation property.

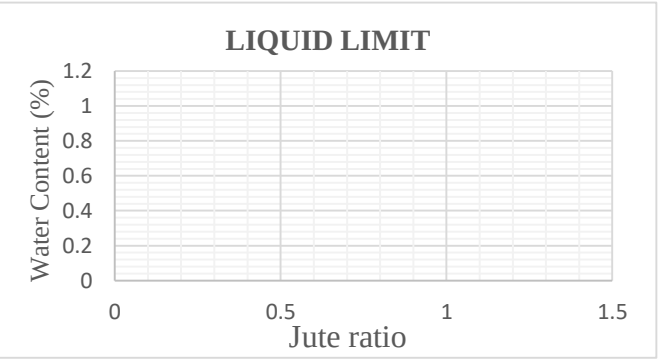
Therefore, the improvements in shear strength has been taken and comparative studies on the stabilization of soil is carried out using different proportion of Geo-jute.

MATERIALS USED:

In this project the material used as stabilizer is Geo Jute.

Various tests performed on this material are also discussed in the following process and experimentally it is proved by the research that the soil changes its property after adding the Geo Jute. Major materials used are;

RED SOIL:



The red soil used in the investigation was the natural soil collected from Marudhamalai, Coimbatore district. The soil sample was collected from a depth of 60cm after removing the top surface soil from natural ground surface.

The soil plays a major role in determining the depth of the foundation required to keep a building safe. The soil bearing capacity (SBC), dry density of the soil plays a major role in design of any kind of foundation. Hence study of soil plays a very important role in civil engineering projects

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JUTE:

The jute was procured from the local market.

The diameter of the jute fibre used was 20mm. These fibres were cut in the length of 25mm for conducting our research.

Generally, jute fibres are available in threaded form. These are mechanically, woven fibres with very fine threads.

LABORATORY TESTS:

The properties of the clay were determined by conducting various laboratory tests such as

a) Sieve analysis
b) Specific gravity test
- Wet sieve analysis
- Hydrometer analysis

c) Atterberg's limit test
Liqiud limit Plastic limit
d) Standard proctor test
e) Unconfined compression test

RESULT AND DISCUSSION:

LIQUID LIMIT:

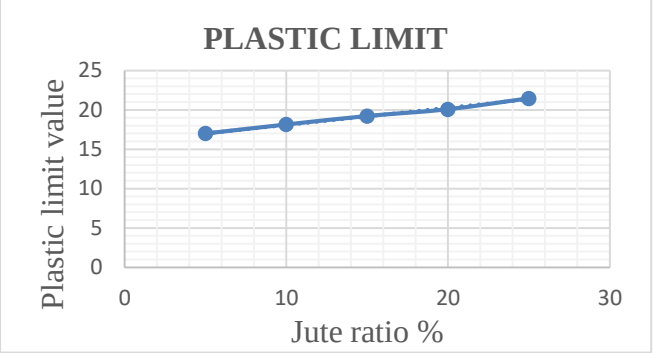
It is the water content at which the soil changes from liquid state to plastic state or minimum water content at which soil just begins to flow. It is the ratio which signifies the relative consistency of a cohesive soil in the nature state.

SOIL SAMPLE RATIO WITH JUTE	LIQUID LIMIT VALUE
5%	30
10%	35
15%	36
20%	42.5
25%	47.5

PLASTIC LIMIT:

It is the water content at which soil changes from plastic state to semi-solid state or minimum water content at which soil rolled into threads of 3mm diameter just crumbles. The water content at which a soil changes from a -plastic consistency to a liquid consistency.

SOIL SAMPLE RATIO WITH JUTE	PLASTIC LIMIT VALUE
5%	17
10%	18.14
15%	19.21
20%	20.077
25%	21.45

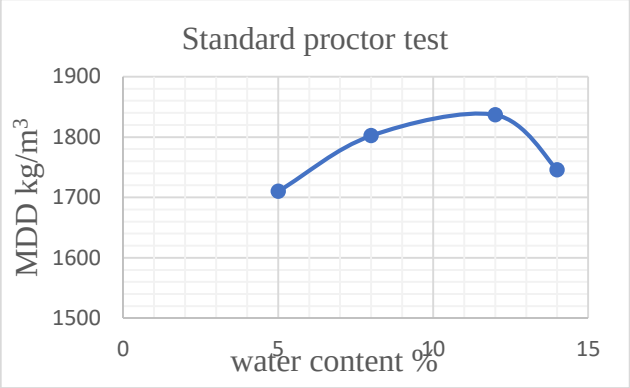


The proctor compaction test is a laboratory method of experimentally determining the optimal moisture content at which a given soil type will become most dense and achieve its maximum dry density. It is a laboratory geotechnical testing method used to determine the soil compaction properties, specifically, to determine the optimal water content at which soil can reach its maximum dry density. The soil is usually compacted into the mold to a certain amount of equal layer, each receiving a number of blows from a standard weighted hammer at a specific height. The graphical relationship of the dry density to moisture content is then plotted to establish the compaction curve. The maximum dry density is finally obtained from the peak point of the compaction curve and corresponding moisture content, also known as the optimal moisture content.

Weight of empty can (g)	Weight of can and wet soil (g)	Weight of can and dry soil (g)	% Water content
140	290	280	7.14%
130	162.34	158.20	14.68%
122	190.22	177.80	20.76%

126	278.10	256	25.67%
86	194.80	168.60	41.87%

MDD kg/m³	1710.1	1802.2	1836.8	1745.8	1645.3
W.C %	7.14	14.68	20.76	25.67	41.87



UNCONFINED COMPRESSION STREGTH

After the compaction test the compressive strength of the sample is measured. Cylindrical specimen is compacted by static compaction in 3.8 cm diameter and 7.6 cm high mould. The inner surface of the mould is lubricated with mobile oil so as to extrude the sample from mould with minimum disturbance. The sample is placed inside the specimen mould in seven layers using spoon, leveled and gently compacted. Pressure pad will be inserted into the mould and the whole assembly will be statically compacted in loading frame to the desired density. The sample is to be kept under static load for not less than 10 minutes in order to account for any subsequent increase in height of sample due to swelling. The sample will then be removed from the mould with the help of sample extruder. Initial dimensions are measured.

SL.NO	JUTE	UCS, Kg/cm^2
1.	5%	2.75
2.	10%	3.64
3.	15%	3.8
4.	20%	3.45

CONCLUSION:

The protection of environment is a vital issue in the world. The demand of jute is raised for environment friendly for future.In this investigation we have used jute fibre pieces in different proportion to study its effect on various geotechnical properties of soil. The results of the testing clearly shows that the engineering properties of the soil importance considerably due to stability with jute fibre geotextile.As the maximum density increases generally optimum moisture content (OMC) of the soil will be increasing. Based on the observation, the density increase with the increase of jute.

Since maximum dry density was obtained at 1 % addition of jute. It is obtained that by increasing the jute fibre content percentage of MDD decreases and OMC increases. Geo jute has many potential applications in civil construction works. The engineering properties of jute are suitable for separation, reinforcement, drainage and filtration and can be suitably used in overcoming geotechnical problems of weak soil. Since, the jute is used as vegetable, geo-textile, biogas, biodegradable products which have impact on the environment. There are lots of scopes for future research in this economy, environment friendly issue.

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