Research on the Soil Stabilization Using Shredded Rubber Tyre Tube

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Abstract- *As we know that clayey soil is unsafe due to its low load bearing Capacity .It generally shows very low yield stress, low strength, high compressibility, low permeability and also low quality for construction. There is variety of ground improvement techniques available which can be undertake for the improvement of load bearing capacity of clayey soil. In the present investigation, old waste rubber tube chips from used waste rubber tube have been chosen as the reinforcement material in different percentages of waste rubber tube chips content i.e. 0.5, 1, 2 & 3 by weight of soil. The examination has been centered on the quality conduct of soil fortified with arbitrarily included old waste rubber tube chips. The samples were subjected to standard proctor compaction test and California bearing ratio test*

Keywords- Rubber Tube Chips, CBR, Proctor test etc

I. INTRODUCTION

Soil Reinforcement: Soil reinforcement is defined as a technique to improve the engineering characteristics stiffness and strength of soil. Soil reinforcement is necessary in lands where chances of erosion are high. It is particularly useful in areas with soft soil as it cannot provide adequate support to any construction or building. Use of shredded tubes in geotechnical engineering for improving the soil properties has received great attention in the recent time.

II. MATERIAL USED

The soil collected from Shahpurkandi Jugial Pathankot, Punjab is highly susceptible to various environmental and natural factors such as high compressibility, poor shear strength, temperature changes, etc. Old waste rubber tube chips having average size of about 2-3mm diameter and 24-26mm length and in 0.5%, 1%, 2%, & 3% by weight of soil after removing steel belting and nylon thread are used extensively.

Fig.1 shredded rubber tube used

PROPERTIES OF SOIL

According to India Standard of soil classification, the soil was classified as clay of low compressibility and other properties of soil are given below in the table.

Table 1- Properties of Virgin soil sample

SR.NO.	PROPERTIES OF SOIL	LABORATORY VALUE
1.	Specific gravity (G)	2.64
2.	Atterberg limits(%)	
	Liquid limit	42
	Plastic limit	22
	Plastivity index	20

3.	Indian Standard Classification	CI (Clay of Medium Compressibility)
4.	Standard Proctor Test Results	
	Maximum Dry Density (KN/M cube)	17.01
	Optimum Moisture Content(OMC) in %	16.0

III. METHODOLOGY

The improvement clayey soil is studied by conducting CBR Test standard protector compaction test on virgin clayey soil with different percentage of old waste rubber tube chips i.e. 0.5, 1,2 & 3% by weight of soil.

Following are the various test performed for the percent study:-

(1) Specific gravity by pycnometer.

(2) Liquid limit casagrande's apparatus.

(3) Plastic limit test.

(4) Optimum moisture content and maximum dry density by standard proctor test.

(5) Optimum moisture content and maximum dry density by standard proctor test of clayey soil with 0.5%, 1%, 2% and 3% old waste rubber tube chips.

(6) California bearing ratio test for virgin clay soil.

(7) California bearing ratio test for clayey soil with 0.5%, 1%, 2% and 3% old waste rubber tube chips.

IV. EXPERIMENTAL RESULTS

This deals with the analysis of various tests. The result of various tests:

Table 2:- Standard proctor compaction test result of clayey soil different percentage of old waste rubber TUBE chips (0.5, 1, 2 & 3).

SR NO.	% OF OLD WASTE RUBBER TUBE CHIPS	% OF MOINSTURE CONTENT	DRY DENSITY (KN/M CUBE
1.	0	16.0	17.01
2.	0.5	15.8	16.8
3.	1	15.6	16.6
4.	2	15.3	16.4
5.	3	15.1	16.3

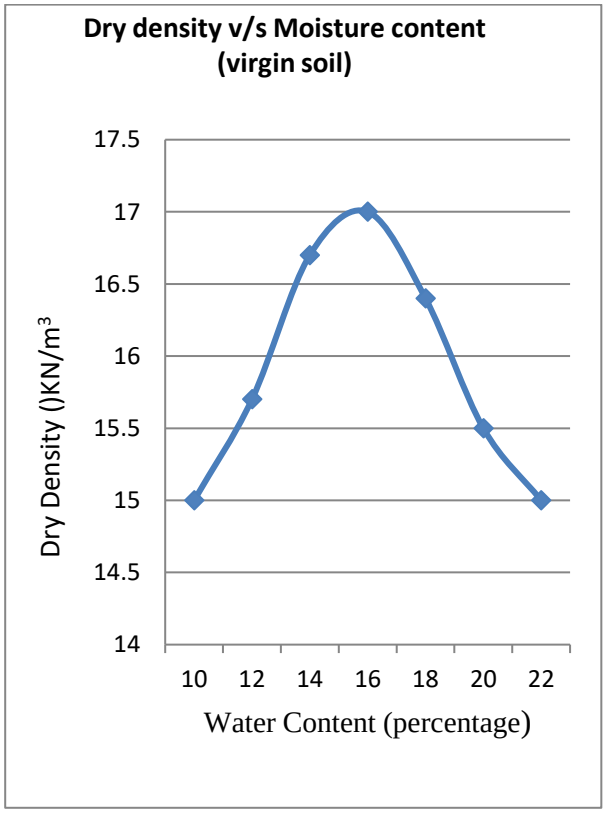

Fig.2: Dry density v/s Moisture content (virgin soil)

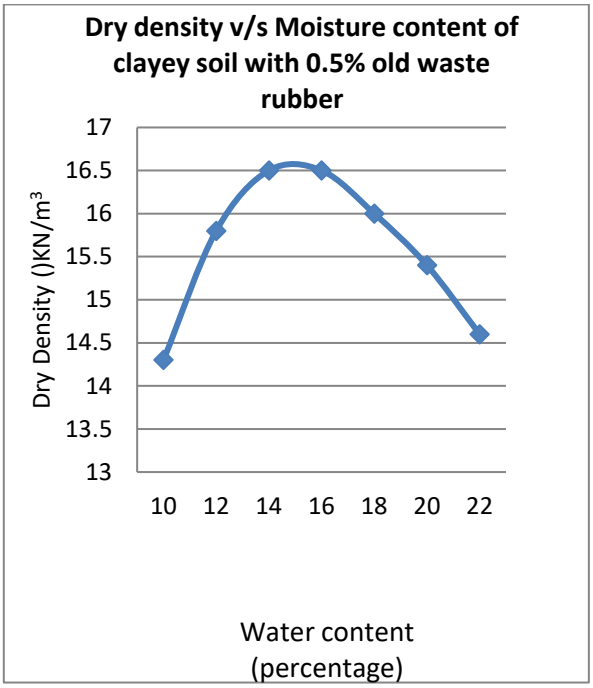

Fig.3: Dry density v/s Moisture content of clayey soil with 0.5% old waste rubber

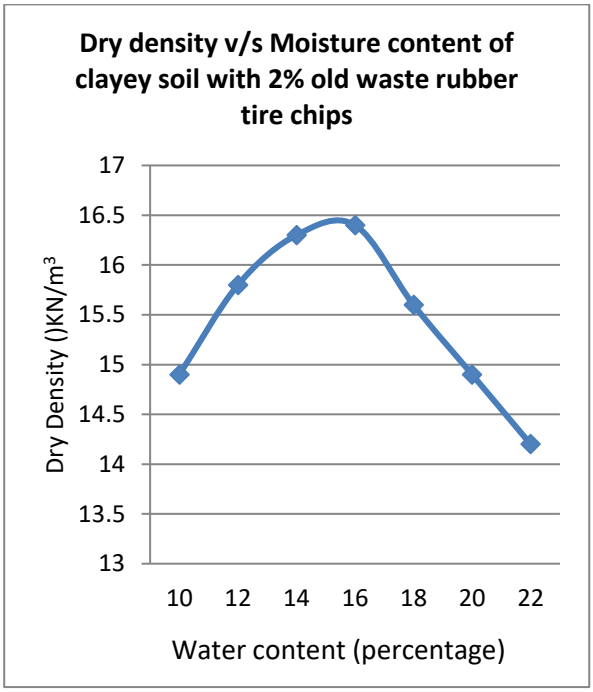

Fig.5: Dry density v/s Moisture content of clayey soil with 2% old waste rubber tube chips

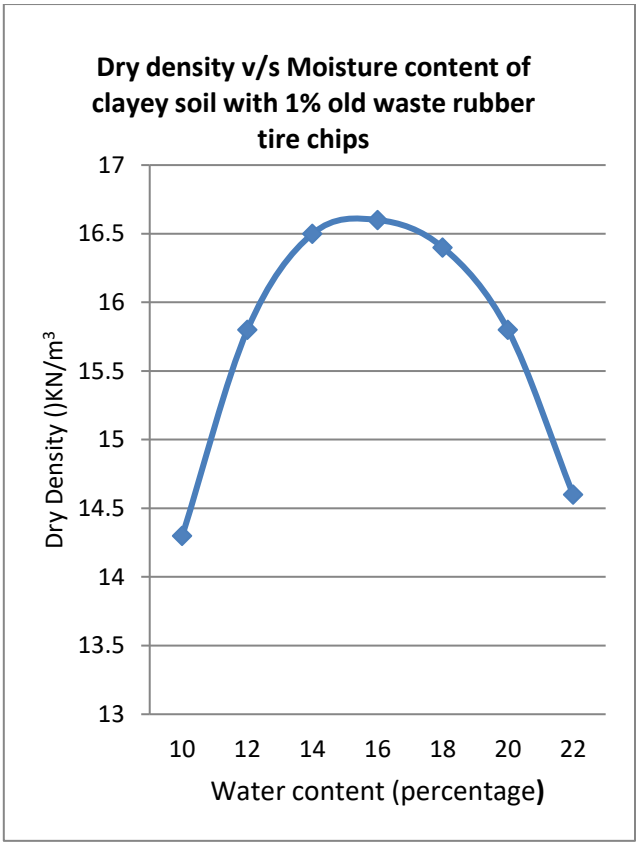

Fig. 4: Dry density v/s Moisture content of clayey soil with 1% old waste rubber tube chips

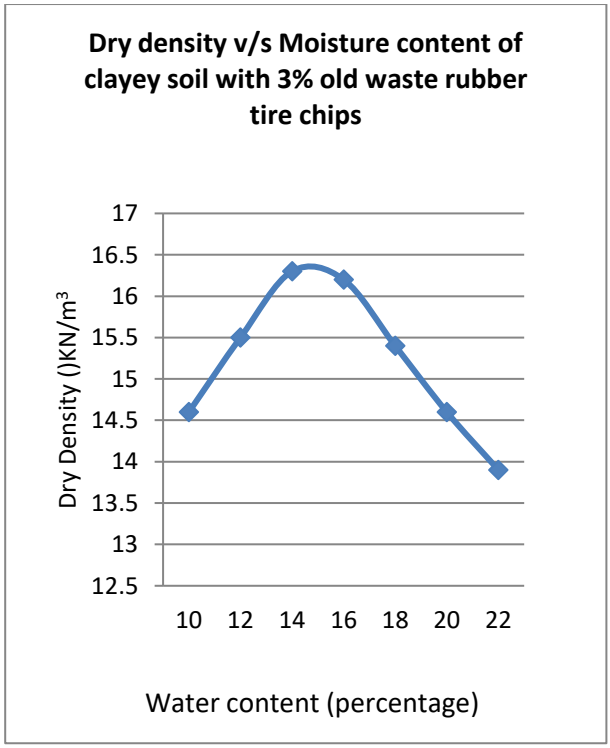

Fig.6: Dry density v/s Moisture content of clayey soil with 3% old waste rubber tube chips.

CBR test result for different percentage of lime and old waste rubber tube chips i.e.0.5,1, 2&3 for 7 days curing with clayey soil

Table 3:- CBR test result for different percentage of old waste rubber tube chips

SR.NO.	% OF OLD WASTE RUBBER TUBE CHIPS	CBR VALUE
1.	VIRGIN SOIL	3.7
2.	0.5	4.1
3.	1	4.4
4.	2	4.8
5.	3	4.6

The above results have been calculated using the following formula.

$$CBR\ (\%) = \frac{[\text{Load sustained by specimen at 2.5 mm and 5 mm penetration}]}{\text{Load by standard aggregate at same penetration level}} \times 100$$

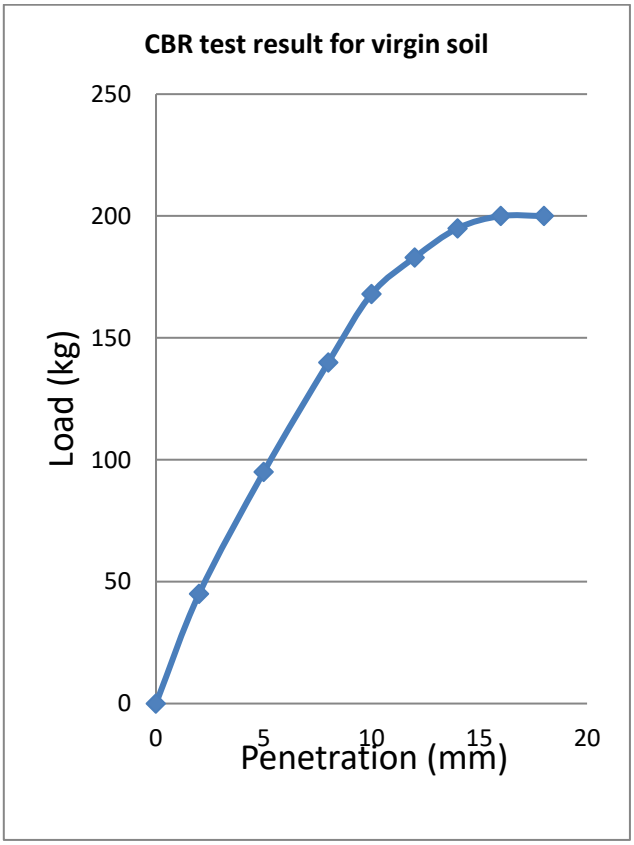

Fig.7: Load v/s Penetration (virgin soil)

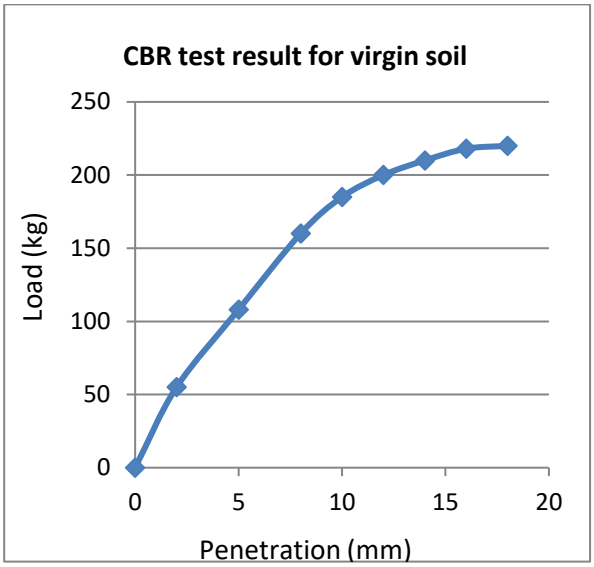

fig.8: Load v/s Penetration of clayey soil with 0.5% old waste rubber tube chips

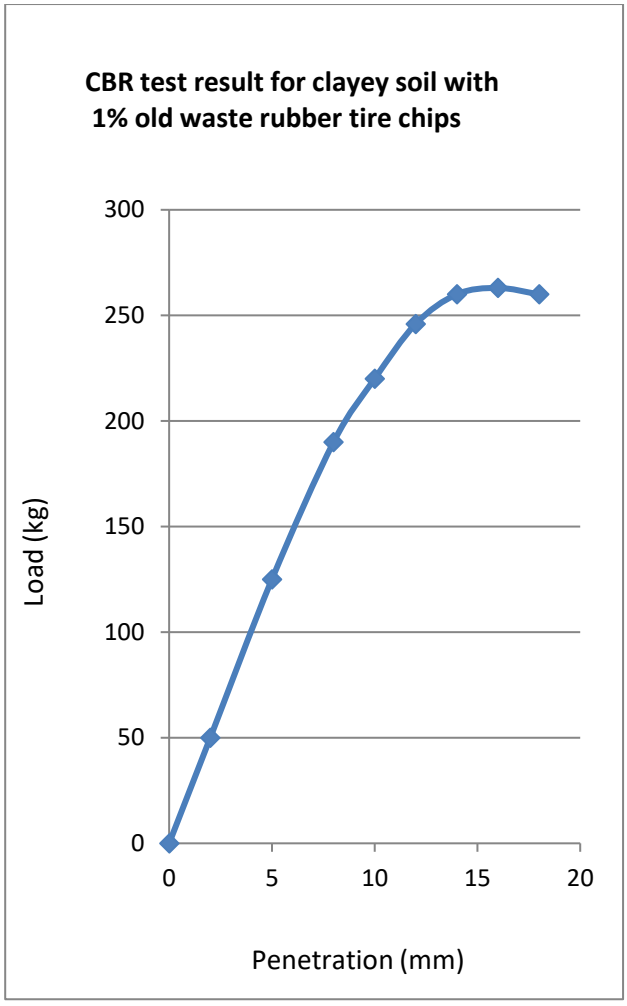

Fig.9: Load v/s Penetration of clayey soil with 1% old waste rubber tube chips

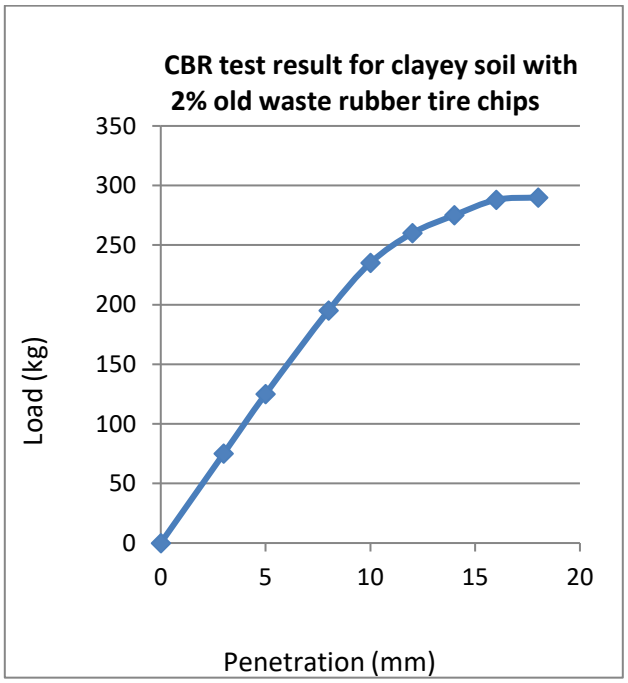

Fig.10: Load v/s Penetration of clayey soil with 2% old waste rubber tube chips

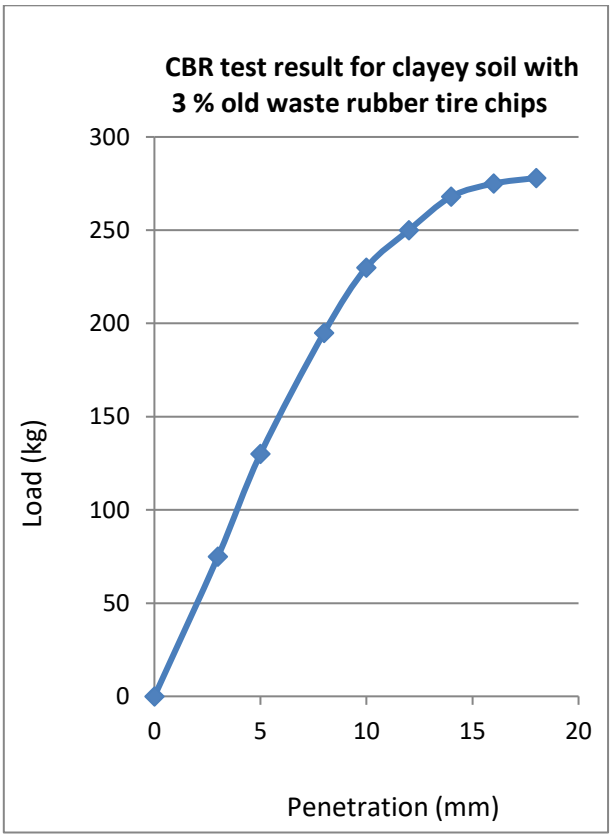

Fig.11: Load v/s Penetration of clayey soil with 3% old waste rubber tube chips

V. RESULTS AND CONCLUSIONS

On the basis of experimental works carried out on clayey soil and Rubber tube chips mixture, the following conclusions and observations are drawn.

It is found that the California bearing ratio value of treated clayey soil is higher than that of untreated clayey soil. In this study the improvement in California bearing value of clayey soil obtained by mixing

Clayey soil and old waste rubber tube chips in 0.5%, 1%, 2%, & 3% by weight of soil.

It can be concluded that old waste rubber tube chips can be considered as a decent earth reinforcement material

1. The CBR value of clayey soil is 3.7 and it increases 4.8, 30% with addition of 2% rubber tube waste chips when observed in soaked condition. This improvement is because of the reinforcing effect of old waste rubber tube chips.

2. It has been observed that, with the expansion of old waste rubber tube chips in clayey soil. The moisture content decreases and dry density of the clayey soil is also decreases.This might be due to light weight nature of tyre waste.

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