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Use of Shredded Tyre Waste in Improving the Geotechnical Properties of Expansive Black Cotton Soil as Well as Cohesive Soil

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Abstract—*To suit major structural building ventures in the creating nation and to take care of the issues which are emerging step by step? As the information says that collection of waste tire in late decades has caused natural issues the world over. A powerful solution for explaining this issue is to utilize scrap tire material to balance out strong and dark cotton soil. A trial examination is to be done on impacts of including destroyed tire chips the dependability and bearing limit of strong and dark cotton soil.*

Keywords*: Ventures, destroyed, bearing limit, Dark cotton soil etc.*

1. INTRODUCTION

As India is riding on strong development and increasing number of vehicles are hitting the streets, so are tires. In the last five fiscals (FY10 to FY15), the tire business in the nation has developed at a CAGR of 12%. On the other side, the great development has acquired its wake more difficulties to the earth. As indicated by reports, all around 15 million tons of waste tires are created every year, out of which India contributes one million tons. Knowing the effect of waste tires on condition and awkward procedures to arrange them of, created nations have restricted imports of waste tires, as well as are forcefully pushing fares of such tires to creating nations, for example, China, India, Southeast Asian nations, Middle-East and some African countries. Nations which are less genuine about waste tires affect are the favoured goal for transfer of waste tires. This theory work speaks to how to securely arrange the elastic tires waste to spare nature and climate of the earth. These tire waste can be used by cutting them into little pieces called as "Destroyed Tire" for the change of geotechnical properties of soil, for example, stack bearing limit, shear quality and so on and contamination can be decreased.

1.1 Literature Review

The rule of soil bolster at first made in 1966 incorporates carrying malleable contradicting materials into the earth to redesign its quality properties so as improve soil property, increment bearing characteristics. [1]. Different materials are used for the soil stabilization. Now waste materials are used for the soil stabilization such as fly ash, shredded tyre, polythene bag etc. It has a long history of utilization as a waste material and has been effectively utilized in geotechnical applications. As the interest for more temperate techniques to enhance soil keeps on expanding consideration had been swung to reusable metropolitan waste as a potential wellspring of materials for soil support. The investigation says that the unconfined and CBR tests were completed in the lab for various blend extents of elastic with dark cotton soil and change was found in quality of dark cotton and soil for the 2% percent blend of elastic tire chips [2].

The considers say that the framework undertakings, for example, expressways, railroads, water repositories, recovery and so on which requires earth material in huge amount. In urban zones, obtain earth isn't effortlessly accessible which must be pulled from a long separation. By and large, substantial zones are secured with very plastic and far reaching soil, which isn't reasonable for such reason [3]. As fly ash is energetically open for wanders in the district of a Thermal Power Plants, it can be used for modification of broad soils for various vocations [4].The examination on BC soil blended with adaptable chips. Compressibility tests and tri-focus tests were driven. The weight strain relations and quality parameters were reviewed. It was discovered that the estimation of inward contact and extreme relationship of soil reached out with increment in level of adaptable up to 15%. The reason for this examination was to explore the likelihood of the use of present day misuse piece adaptable to counterbalance soils [5].

1.2 Materials and Properties

1.2.1 Black Cotton Soil-Black cotton soil is collected at1m below the ground level which is in Lalsot (Dausa, Raj.). The index properties are discussed below.

Table No 1: Properties of Soil

Description	Properties (value)
Specific Gravity	1.41
Liquid Limit	53.37%
Plastic Limit	32.57%
Plasticity Index	20.8%

1.2.2 Shredded Tyre Waste-Tyre waste was collected from the local tyre shops and converted into small pieces of size ranges 10-25 mm length and thickness of 3-5 mm.

2. EXPERIMENTAL DETAILS

2.1 Preparation of specimen for the calculation of optimum moisture content- A soil sample of 2kg is taken which is passed through 4.75mm sieve and a mould of 944ml is taken with dia 100mm.The weighted sample is mixed with water content of definite proportion and mixed thoroughly and filled in mould with compaction in three layers with 25 no. of blows in each layer. The dry density of soil is obtained, and graph is plotted between water content and dry density and maximum dry density is obtained at optimum moisture content. A soil sample of 2kg is taken which is passed through 4.75mm sieve and 2%, 4%, 6%, 8% and 10% of shredded tyre waste is added in soil at regular testing and mould of 944ml is taken with dia 100mm.The weighted sample is mixed with water content of definite proportion and mixed thoroughly and filled in mould with compaction in three layers with 25 no. of blows in each layer. The dry density of soil is obtained, and graph is plotted between water content and dry density and maximum dry density is obtained at optimum moisture content.

2.2 Preparation of specimen to perform California Bearing Ratio test with black cotton soil- A soil sample of 5kg is taken which is passed through 4.75mm sieve and optimum moisture content 14% is added and soil is mixed thoroughly and filled in mould in three layers with 25 no. of blows in each layer. A test is performed and deflection in pivot ring and dial gauge is measured and load penetration curve is plotted. A soil sample of 5kg is taken which is passed through 4.75mm sieve and shredded tyre waste is added in 2%, 4%, 6%, 8% and 10% and optimum moisture content 14% is added and soil is mixed thoroughly and filled in mould in three layers with 25 no. of blows in each layer. A test is performed and deflection in pivot ring and dial gauge is measured and load penetration curve is plotted.

2.3 Unconfined compression strength test for black cotton soil and with shredded tyre waste-The test is performed with black cotton soil as well as with addition of shredded tyre waste in 2%, 4%, 6%, 8% and 10% and tests are performed in laboratory. UCS value of plain black cotton soil- 2.17 kg/cm^2. The total improvement in UCS value from experimental study was 0.8% and 8.29 % with 2 % addition of shredded tyre waste.

2.4 Permeability Test-

The coefficient of permeability of shredded tyre waste varies between 1.56 to 15 cm/sec., depending upon its void ratio. The permeability of sample is determined with addition of shredded tyre waste of 2%, 4%, 6%, 8% and 10%.

3. RESULTS AND ANALYSIS

Analysed results obtained from the adopted methods. As optimum moisture content (OMC) and maximum dry density (MDD) have shown in Table No 2. It is clearly visible from Table 2 that with increase in percentage of tyre waste OMC is increasing, whereas MDD is decreasing.

Table No 2: Percent Tyre Waste and OMC & MDD

%TYRE WASTE	0	2	4	6	8	10
OMC (%)	14	14	16	18	18	20
MDD(gm/cm^3)	2.12	2.11	2.10	2.09	2.07	2.06

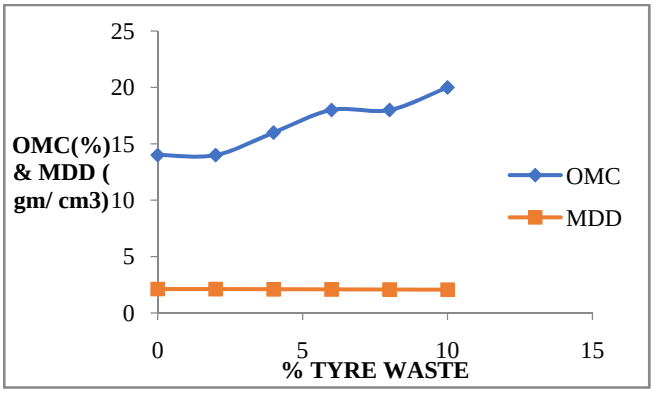

Figure 1 Graph between %Tyre wastes, OMC & MDD

Table No 3: Percent Tyre waste & UCS Value

S. NO.	PERCENTAGE (SHREDDED TYRE WASTE)	UCS VALUE (KG/CM^2)
1.	2%	2.35
2.	4%	2.21
3.	6%	2.16
4.	8%	2.11
5.	10%	2.06

The Fig. No 2 has shown the correlation between unconfined compression strength (UCS) and Tyre waste. The experimentally found that when percentage of Tyre waste

increasing then decreasing the value of unconfined compression strength UCS. So that we can say UCS value is inversely proportional to the percentage of Tyre waste.

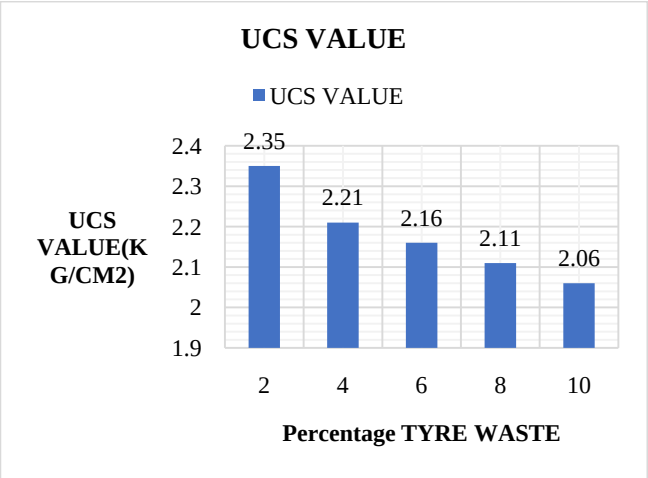

Fig. 2 Graph between UCS value and Percentage Tyre waste

Table No 4 CBR Value and % Tyre Waste

TYRES (%)	0	2	4	6	8	10
CBR VALUE (%)	5.24	11.98	11.29	11.16	11.02	10.99

As per given Table No 4 we can seen the CBR value initially increased when we increasing percentage of Tyre waste after a certain percentage CBR value will be Decreased. The maximum CBR value obtained at 2% of Tyre waste. The CBR value indicate bearing strength of soil, so we can say when CBR value more its mean soil is more stable with respect to load.

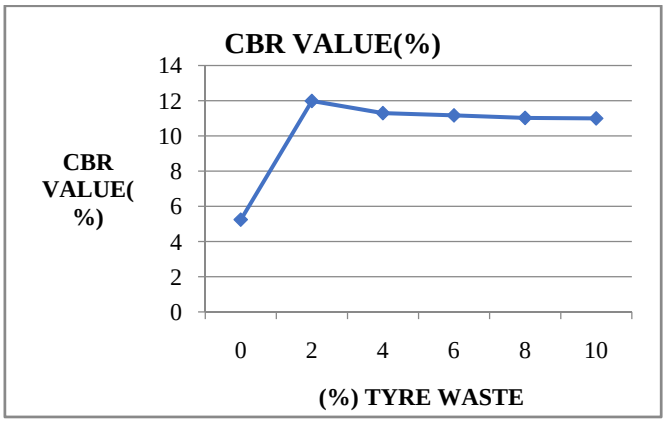

Fig. 3: CBR Value and Percentage Tyre Waste

Table 5: Percent Tyre waste and Permeability

% Tyre Waste	0	2	4	6	8	10
Permeability	4.6	5.67	5.89	6.72	6.91	7.53

Fig. No 4 shown that Percentage Tyre waste increased than permeability will increase. In Soil mass permeability indicate Voids are present in the soil Strata, soil mass have more permeability it means soil have poor strength. Fig. No 4 indicates that permeability is directly proportional to the percentage Tyre waste.

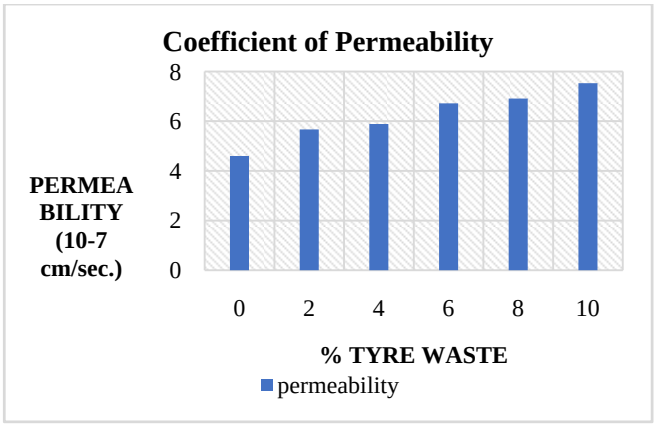

Fig. 4 Coefficient of permeability & Percentage Tyre waste

4. CONCLUSION

Based on experimental studies on soil with shredded tyre waste, following observation and conclusion are obtained-The OMC is observed to increase with increase in shredded tyre waste due to absorption property of tyre. The MDD is observed to decrease with increase in shredded tyre waste due to light weight of tyre waste. When 2% of shredded tyre waste is mixed with black cotton soil, it is observed to have increase in UCS of 8.29% than black cotton soil. The increase in percentage of UCS value leads to improve the strength of black cotton soil and can be used for stabilizing and control the environmental pollution

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