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Experimental Study on Stabilization of Reinforced Black Cotton Soil with Bagasse Ash

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Abstract: ***Utilization of industrial waste and agricultural waste products in the industry has been the focus of research for economic, environmental and technical reasons. Sugar Cane bagasse is a fibrous waste product of the sugar refining and causing serious environmental pollution which calls for urgent ways of handling the waste. In many situations, soils in natural state do not possess adequate geotechnical properties to be used as road service layers in rural areas. Bagasse ash can be utilized to stabilize the expansive soil. The aim of this research was to maintain environmental balance by avoiding the problem of ash disposal and to improve the subgrade characteristics of expansive soils. The soil taken for this study was classified as CH as per Indian Standard Classification System. Different dosages of bagasse ash i.e.2 %, 4%, 6% and 8% were used in this study to stabilize the expansive soil. The usage of this Bagasse ash material in road construction can prove efficient in increasing the strength of soil and in turn reducing the project cost. From the results it was observed that significant improvement of subgrade characteristics at addition of 4% bagasse ash with expansive soil.***
Keywords: Bagasse ash, expansive soil, CBR, UCS, OMC and MDD

I. INTRODUCTION

Soil is a base of any structure, which actually supports it from beneath and distributes the load effectively. In many situations, soils in natural state do not possess adequate geotechnical properties to be used in many civil engineering works. Effective utilization of local weak soil by imparting additional strength using stabilization enables reduction in construction and improves performances for the projects related to civil engineering. Today, world is facing a serious problem in disposing the large quantity of agricultural waste like Bagasse, rice husk and groundnut shell etc. The disposal of agriculture waste without proper attention creates hazardous impact on environmental health. Sugarcane Bagasse Ash (SCBA) is the organic waste obtained from the burning of bagasse in sugar producing factories. Bagasse shows the presence of amorphous silica, which is an indication of pozzolinic properties, responsible for holding the soil grains together for better shear strength. The use of bagasse ash as stabilizing material for clayey soil can be checked under various tests such as standard proctor test, California bearing ratio and Unconfined Compressive Test (UCS) tests.

A. Scope of the Study

In remote rural villages, the development of road network is of vital importance in the socioeconomic development. Especially in rural villages having black cotton soil as subgrade, it is very difficult to lay the pavement. As the bagasse Ash is an industrial waste from cane mills, the optimum usage of this material in subgrade soil stabilization will bring down the construction cost of the pavements. In our study an attempt is made to stabilize black cotton soil with addition of bagasse ash. The strength parameters like OMC, MDD, CBR and UCS are determined to know the suitability of material.

II. MATERIALS

A. Black Cotton Soil: Black cotton soils are highly clayey soils, greyish to blackish in colour found in several states in India. The black cotton soil taken for the present study is collected from village Draksharama, District East Godavari from the depth of 0.3 to 0.4 m below the ground surface. Rich proportion of montmorillonite is found in Black cotton soil from mineralogical analysis. High percentage of montmorillonite renders high degree of expansiveness.

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Fig.1.Blackcotton soil after oven dring

Sugar Cane Bagasse Ash: Generally Bagasse ash is the residue obtained from the incineration of bagasse in sugar producing factories. The Bagasse ash used in the study was collected from the field of village Guddippa of Visakhapatnam District. Initially the bagasse is collected from fields, dried and later set to fire. Finally Bagasse ash is obtained and is collected into bags. On visual inspection the Bagasse Ash appeared dark black color and comes in fibrous form. The obtained bagasse is then sieved through 4.25 microns.



Fig.2.Sugarcane bagasse, burning into fire, Bagasse ash

III. METHODOLOGY

The following gives the list of main tests performed in order to study and determine the subgrade characteristics of black cotton soil and soil +bagasse ash.

A. Compaction

Test was done in accordance to Indian standards code of practice (IS 2720 PART-7, 1980). Physical method of testing was used for this test.

B. CBR Test

Test was done in accordance to Indian standards code of practice (IS 2720 PART-16, 1987) for laboratory testing.

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C.UCS Test

Test was done in accordance to Indian standards code of practice (IS 2720 PART-10, 1991) for laboratory testing.

Properties	Value
Specific gravity	2.72
Liquid limit (%)	51.5
Plastic limit (%)	23.9
Plasticity Index	27.6
IS Symbol	CH
OMC (%)	22
MDD(g/cc)	1.508
CBR (%)	3.4
UCS (kg/cm2)	0.412

Table.1.Fundemtal Properties of black cotton soil

IV. RESULTS AND DISCUSSIONS

The following results were obtained in standard proctor test and the following table represents the variation of moisture content and MDD with different proportions of bagasse ash.

Property	OMC (%)	MDD(g/cc)
Soil+2%baggase ash	16.27	1.593
Soil+4%baggase ash	15.68	1.879
Soil+6%baggase ash	23.23	1.495
Soil+8%baggase ash	27.76	1.365

Table.2.Variation of OMC and MDD with Bagasse ash

The addition of bagasse ash by weight (2% , 4% , 6%, 8%) to the soil sample caused decrease in OMC from 16.27% to 15.68% for 2% to 4% of bagasse ash and later it was observed that there is increase in OMC with increases in content of bagasse ash whereas decrease in MDD value for the same content of bagasse ash.

The California Bearing Ratio test of soil is conducted with various percentages of sugarcane bagasse ash on black cotton soil. In case of variation of unit load with respect to penetration of soil with same percentages of bagasse ash the obtained curves are shown below:

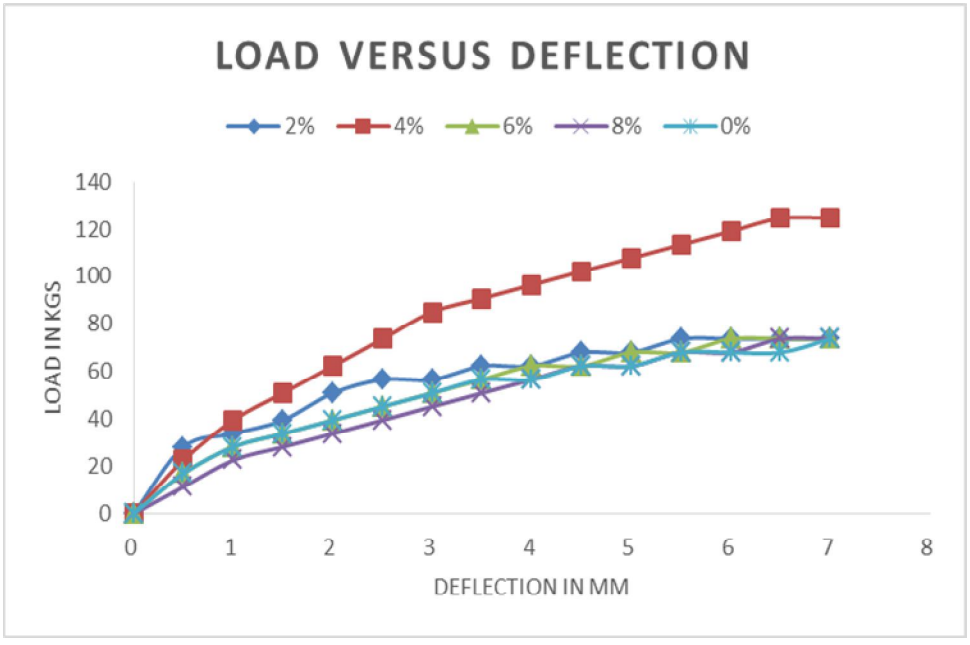


Fig.3.Variation of Unit load against penetration

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The addition of bagasse ash up to weight of (0%, 2%, 4%, 6%, 8%) to the soil samples caused an increase in CBR value at the rate of 3.4%, 4.13%, 5.38% up to 4% and later there is decrease in CBR value at the rate of 3.31% and 2.94% respectively. The following chart clearly indicates the variation.

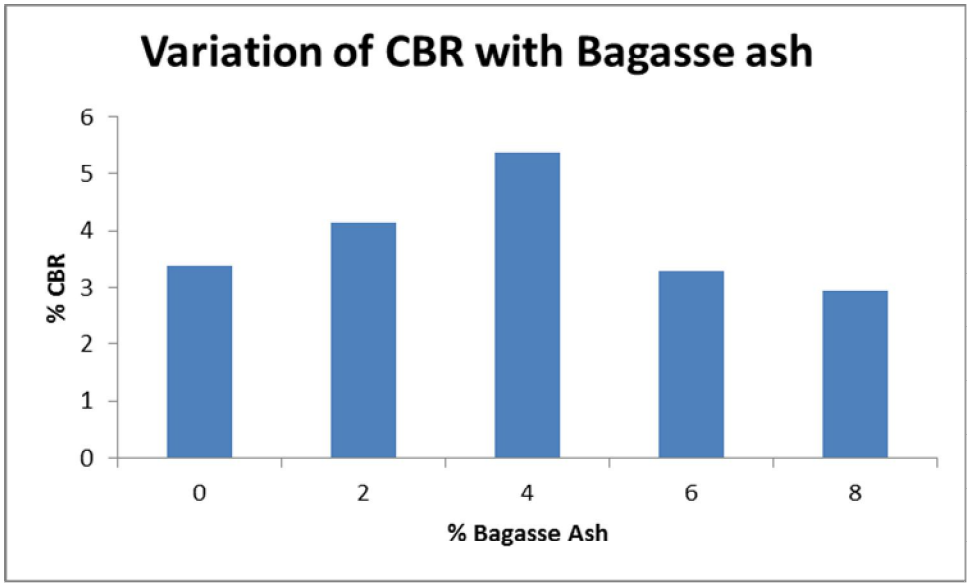


Fig.4.Variation of CBR with Bagasse ash.

The unconfined compressions test were conducted conducted with various percentages of sugarcane bagasse ash on black cotton soil and the following figure represents the variation of unconfined compression strength with percentage of bagasse ash. The stress versus strain behaviour is also shown in the same figure with various percentages of bagasse ash.

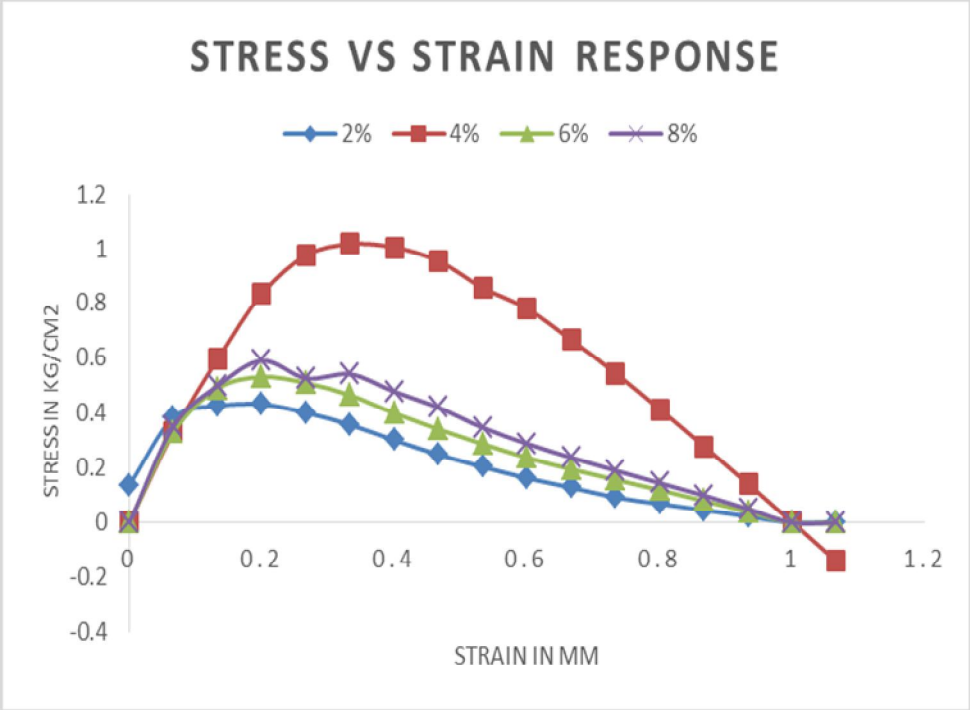


Fig.5.Stress stain response of soil with various % of bagasse ash.

The addition of bagasse ash up to weight of (0%, 2%, 4%, 6%, 8%) to the soil samples caused an increase in UCS value at the rate of 0.412,0.58,1.066 kg/cm2 up to 4% and later there is decrease in UCS value at the rate of 0.571 and 0.53 kg/cm2 respectively. The following chart clearly indicates the variation.

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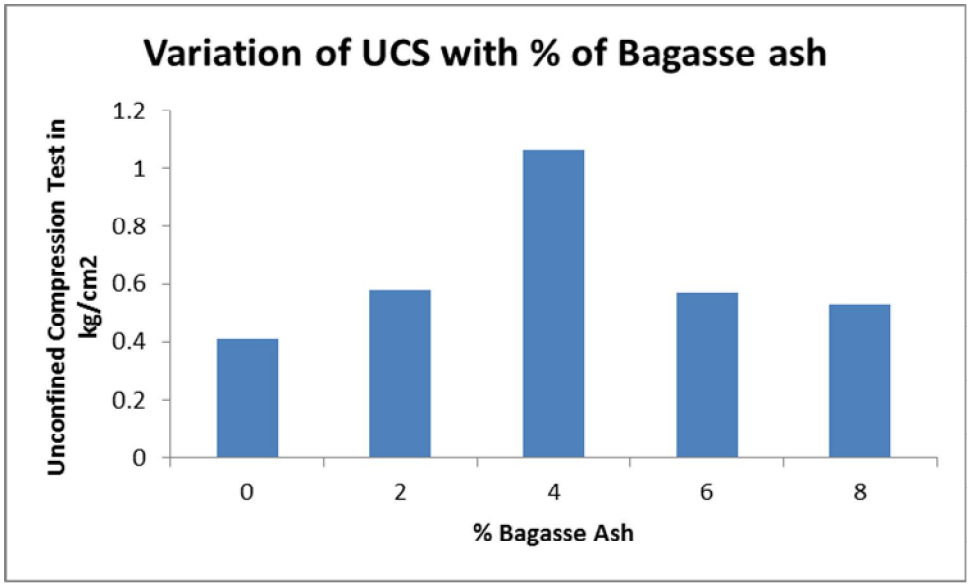


Fig.6.Variation of UCS with Bagasse ash.

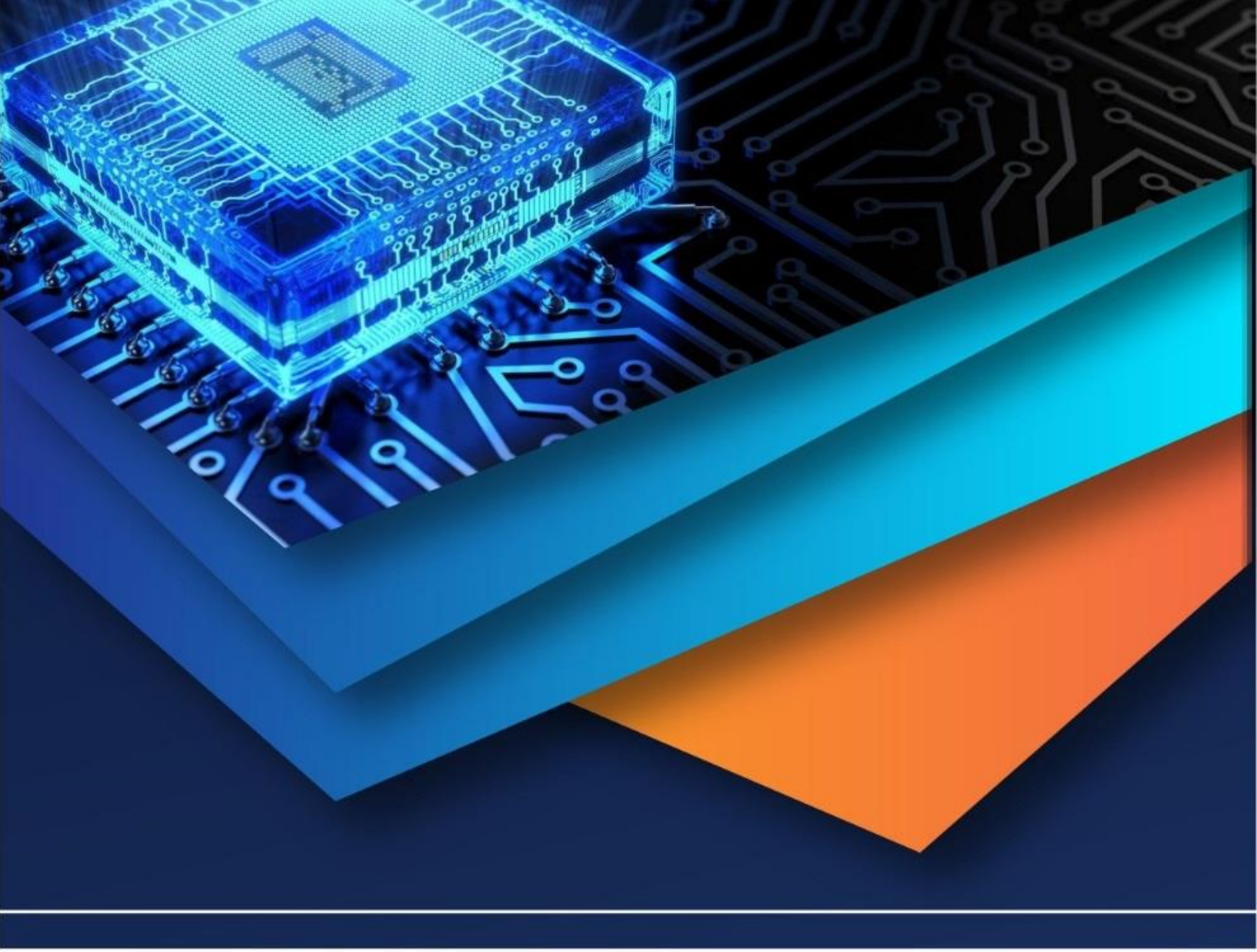
V. CONCLUSIONS

From the values noted above, there was noticeable increase in California bearing ratio of soil when optimum ratio of bagasse ash is added. And to the same ratio, by observing the stress – strain graph drawn for unconfined compressive strength can be valid and ration of bagasse ash can be used. Hence in conclusion, bagasse ash can be used in stabilization of black cotton soil and the optimum content from our study was noticed as 4% by weight.

REFERENCES

[1] Hanifi Canakci, Fatih Celik, Mohammed O. A. Bizne and Media O. A. Bizne, Stabilization of Clay with Using Waste Beverage Can, Procedia Engineering 161 (2016) 595 – 599, Science Direct.
[2] Anjani Kumar Yadav, Kumar Gaurav, Roop Kishor and S.K. Suman,Stabilization of alluvial soil for subgrade using rice husk ash,sugarcane bagasse ash and cow dung ash for rural roads, International Journal of Pavement Research and Technology 10 (2017) 254–261, Science Direct.
[3] Hayder Hasan, Liet Dang, Hadi Khabbaz, Behzad Fatahi and Sergei Terzaghi, "Remediation of Expansive Soils Using Agricultural Waste Bagasse Ash," Procedia Engineering Volume 143, 2016, Pages 1368–1375,Elsevier.
[4] Sruthimol P. R and Sindhu A. R, "Experimental Study on the Effect of Bagasse Ash on Soft Clayey Soil," International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Vol. 4 Issue 11,2015.
[5] M. Chittaranjan, M. Vijay and D. Keerthi, "Agricultural wastes assoil stabilizers" International Journal of Earth Sciences and Engineering, Vol. 04, issue 06 SPL, pp. 50-51(2011).
[6] B Ahmed, A. Rahman And J. Das "Improvement Of Subgrade CBR Value By Using Bagasse Ash And Eggshell Powder", International Journal of Advanced Structures and Geotechnical Engineering ISSN 2319-5347, Vol. 04, No. 02, 2015.
[7] Kanchan Lata Singh and S M Ali Jawaid ,"Geotechnical Properties of Soil Stabilized with Bagasse Ash", International Journal of Biological Research and Technological Research (IJBSTR), Volume 1, Issue 9, pp. 5-8, 2013.
[8] Kiran R.G, Kiran L, "Analysis of strength characteristics of black cotton soil using bagasse ash and additives as stabilizer". International Journal of Engineering Research and Technology, Volume 2, Issue 7, pp. 323-339, 2013.

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