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Stabilization of soil by using rice husk ash

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ABSTRACT: *A large part of central India and a portion of south India is covered with black cotton soils. These soils are residual deposit formed from basalt and trap rocks. These soils quite suitable for growing cotton. Black cotton soils are clays of high plasticity. The soils have high shrinkage and swelling characteristics. The shearing strength and bearing capacity of the soils is extremely low. To avoid these circumstance, soil must be stabilized, and strength should be high. RHA is a fibrous residue of the rice that remains after incineration of rice husk gives the ash. The chemical analysis on rice ash was found to contain mainly silica, potassium, iron, calcium, magnesium, aluminum. when RHA mix with black cotton soil by mass in proportion of 4%, 8%, 12%, 16%. And then geotechnical properties are evaluated.*
KEYWORDS- *Black cotton soil, Rice husk ash, OMC, MDD, CBR*

I. INTRODUCTION

Expansive soil which is also called as black cotton soil is very difficult to be used in construction. This is due to hot climate and poor drainage conditions associated with these soil formations. These soils inhibit the moisture from the surface in monsoon and summer season by means of evaporation. Owing to these reasons, the soil possesses cyclic swell-shrink behavior, low strength, high moisture content, volume change in soil, differential settlement etc. These failures may result in longitudinal and transverse cracking of pavements, surface distress, rutting of surface and deep cutting in foundations. To overcome these circumstances in the soil, it should be treated and stabilized in best way. Rice Husk Ash (RHA) is one of the agricultural waste produced in our country when the rice is milled from paddy. About 108 tons of rice husk is produced in our world annually. Rice husk consists of about 67-90% of silica. The silica is present in this rice husk in amorphous form and it is considered to be a pozzolanic material. It has been estimated that 1000 kg of rice produce 200 kg of rice husk from which 40 kg of rice husk ash would be generated. The rice husk ash is obtained by burning the rice husk at a temperature of about 6000ºC for 24 hours. Since the silica is present in amorphous form, it reacts with CaOH and liberates the heat and forms the cementitious compounds.

II. MATERIALS USED

The materials used in this investigation are black cotton soil, rice husk ash.

1. Black cotton soil: -

The Black Cotton Soil used in experimental work was brought form countryside field of Hingna Nagpur. The Properties of Black Cotton Soil are as shown in table below.

Table -1: Properties of Black Cotton Soil

Properties	Value
Specific gravity	2.35
Liquid Limit	51%
Plastic Limit	28.57%
Plasticity Index	21.43%
Maximum Dry Density	1.71g/cc
Optimum Moisture Content	18.9%

2. Rice husk ash: -

Rice Husk Ash is obtained from the burning of rice husk. The husk is a by-product of the rice milling industry. The RHA used in this study is collected from chakradhar rice mill, kamptee, dist. Nagpur.

Table -2: The basic constituent of RHA

Constituents (%mass)	Percent Content
Fe2O3	0.21
SiO2	90.23
CaO	1.58
Al2O3	2.54
MgO	0.53
Carbon	2.23
KaO	0.39

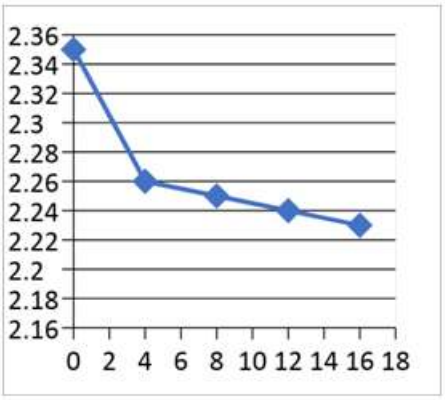
III. METHODOLOGY

The laboratory tests were carried out first on the natural soil which include liquid limit, plastic limit, plasticity index, specific gravity and compaction. A series of laboratory tests were conducted on BC Soil mixed with Rice Husk Ash in various percentages i.e. 4%, 8%,12 %, 16% by weight of dry soil. For the above different proportions, tests are carried out to observe the changes in the properties of soil i.e. maximum dry density and optimum moisture, plastic limit, liquid limit.

IV. RESULTS AND DISCUSSIONS

3.1 Specific gravity

SOIL+%RHA	Specific gravity
0	2.35
4	2.26
8	2.25
12	2.24
16	2.23



3.2.Grain Size Analysis:

Sr no.	Sieve no.	Mass of soil retained (gm)	Cumulative mass soil retained (gm)	Cumalative % of soil retained (%)	% finer (passing) (100-%of soil retained)
1	4.73 mm	63	63	12.6	87.4
2	2.63 mm	79	142	28.4	71.6
3	1.18 mm	118	260	52	48
4	1 mm	28	288	57.06	42.4
5	600 µ	52	340	68	32
6	425 µ	79	419	83.8	16.2
7	300 µ	11	430	86	14
8	125 µ	40	470	94	6
9	75 µ	14	484	96.8	3.2
10	PAN	13	497	99.4	0.6

Coecfficient of Curvature = 1
Coefficient of Uniformity= 7.61
Hence,therefore soil is well graded and coarse grained.

3.3.Atterbag Limits:

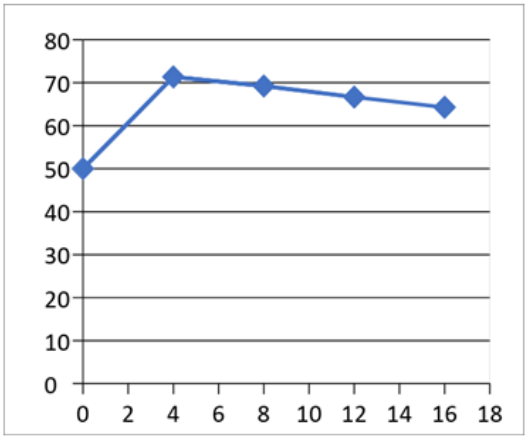
Atterberg Limits such as Liquid Limit, Plastic Limit and Plasticity Index were determined for black cotton soil and black cotton soil with varying proportions of Rice husk ash. For determination of Atterberg's Limits, 100 grams of Black Cotton Soil sample was weighed passing 425 Micron sieve. Accordingly mixing proportion (RHA) was weighed using weighing balance and was mixed with black cotton soil. Similarly for other proportions same procedure was followed. The weight of Black

Cotton Soil weighed for determination of Liquid Limit. Same amount of Black Cotton Soil was taken for determination of Plastic Limit.

V. RESULT

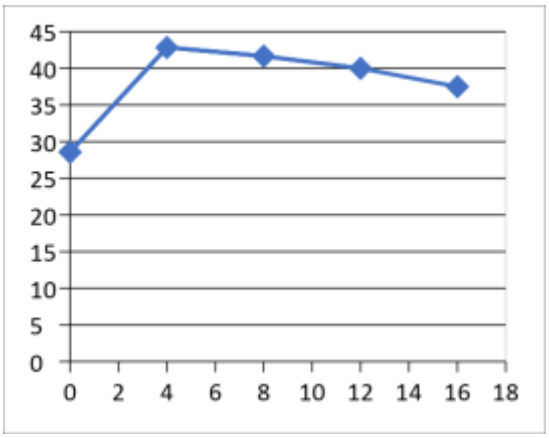
Liquid Limit:

SOIL+%RHA	LIQUID LIMIT
0	50
4	71.36
8	69.23
12	66.67
16	64.28



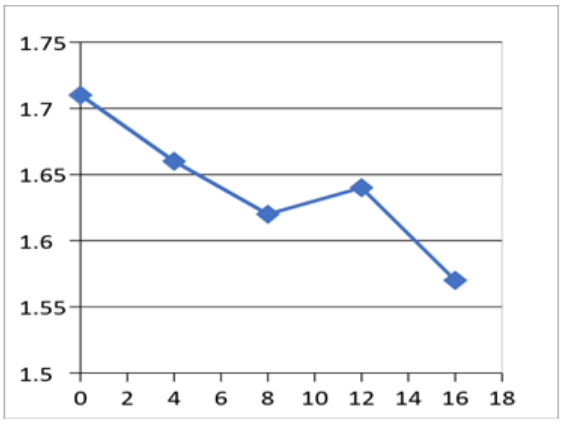
Plastic Limit:

SOIL+%RHA	PLASTIC LIMIT
0	28.57
4	42.85
8	41.66
12	40
16	37.5



3.4.Standard Proctor Test:

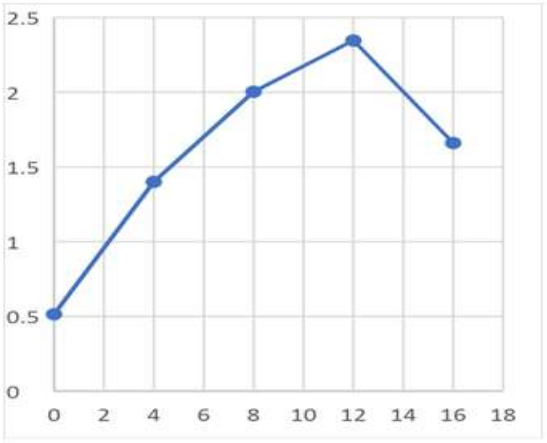
Soil +% of RHA	MDD
0	1.71
4	1.66
8	1.62
12	1.64
16	1.57



3.5.Cbr Test:

All CBR Value are respect to 5mm penetration.

Soil +% of RHA	CBR VALUE
0	0.514
4	1.40
8	2.003
12	2.346
16	1.66



VI. CONCLUSION

- The Specific Gravity of soil is decreases with increase in RHA.
- Coefficient of Curvature = 1, Coefficient of Uniformity= 7.61, Hence, therefore soil is well graded and coarse grained
- Liquid limit in soil First increases up to 4% and then decreases with increase in proportion of RHA.
- Plastic limit in soil first increases up to 4% RHA and then decreases with increase in proportion of RHA.
- MDD Decreases with increase in proportion of RHA.
- CBR Value Increases up to 12%RHA and then decreases hence at mixing 12 % RHA strength is maximum.

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REFERENCE

[1]. Behaviour Of Clayey Soil Mixed With Rice Husk Ash And Lime (International Journal Of Engineering Trends And Technology- May 2014) B.Suneel Kumar & T.V. Preethi.
[2]. An Experimental Investigation On Stabilizing The Soil Using Rice Husk Ash With Lime As Admixture (international journal of informative and futuristic research –may 2016)R .Oviya ,R Manikandan .
[3]. Expansive Soil Stabilization Using Waste from Sugarcane Industry (Journal For Studies In Management And Planning, April-2015)C.Subhacini , M.Ranjitha , S.Dhanapal , K.ArunPrakash , K.Uma Shankar.
[4]. Characteristics of Black Cotton Soil Using Bagasse Ash and Additives as Stabilizer. Kiran R. G., Kiran Lhad.
[5]. Bagasse Ash Stabilization of Lateritic Soil. (Yanful ch27.indd) K.J. Osinubi, V. Bafyau, A.O. Eberemu, and O. Adrian.
[6]. M. Chitstaranjan, M. Vijay, D. Keerthi studied the 'Agricultural wastes as soil stabilizers'
[7]. Improvement of subgrade CBR value by using Bagasse ash and Eggshell powder (international journal of advanced structure and geotechnical engineering, april-2015)B. Ahmed, A. Rahman, J. Das.
[8]. Stabilization Of Clayey Soil Using Sugarcane Bagasse Ash And Rice Husk Ash: Review (International Conference On Recent Trends In Engineering, Science And Management -17)Shivam Bachchhas And D.K. Soni.
[9]. Comparison of Fly Ash and Rice Husk Ash Stabilized Black Cotton Soil (International Journal Of Earth Science And Engineering – October 2011)Laxmikant Yadu , Rajesh kumar Tripathi ,Dharamveer Singh.
[10]. Potentials Of Rice-Husk Ash As A Soil Stabilizer (International Journal Of Latest Research In Engineering And Technology - February 2016)Sudipta Adhikary And Koyel Jana.
[11]. Stabilization Of Soil Using Rice Husk Ash (International Journal Of Computational Engineering Research ,February-2016)Rathan Raj , Banupriya & Dharani.
[12]. 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) Anjani Kumar Yadav, Kumar Gaurav, Roop Kishor, S.K. Suman.
[13]. Improvement Of Clayey Soil Stabilized With Bagasse Ash (International Journal Of Research Review In Engineering Science & Technology- April 2015) Ashish Chhachhia, Anupam Mital.
[14]. A Experimental Study of Black Cotton Soil, Stabilized with Rice Husk Ash, Fly Ash and Lime (International Journal of Engineering Research & Technology (IJERT) November -2014) Pravin Patel Dr. H. K. Mahiyar.
[15]. Soil mechanics and Foundation Engineering Book DR. K.R.ARORA.