

Enhance Property of Expansive Soil by Using of Rice Husk ASH and Bamboo Leaf ASH

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I. ABSTRACT

This experimental of black cotton soil by using of rice husk ash, and bamboo leaf ash. In India approx one-six (about 0.66 million sq. Km) is covered by black cotton soil. In this black cotton soil construct a structure like building, dam, bridges, retaining wall, Roadways pavement etc. soil strata is basic of all these stability. soil is a mother part of all structure if our structure are weak in stability or bearing capacity of all superstructure will be fail or damaged in the respect of settlement failure collapse or sinking or punching settlement may be small or large overall it will be damaged a structure. it due to the settlement crack buckling, bending, shear will be occur. experimental of black cotton soil we mixed with different % of rice husk ash 4% 6% 8% bamboo leaf ash 4% 6% 8% with black cotton soil. Basic properties of black cotton soil liquid limit, plastic limit, shrinkage limit, and differential free swell test are performed. The result show black cotton soil with various % of Rice husk ash L.L and P.L. decreases with increasing % of RHA. S.L. of bcs is increasing with increasing % of RHA in bcs. DFS value is decreasing with increasing % of RHA and BLA in black cotton soil.

Keywords- BCS BLA DFS LL PLRHA

II. INTRODUCTION

India is Agricultural based country. here 70% of population are depending on agriculture for their survival. In agriculture sector play important role for economy. it cover about 17% to the total GDP (gross domestic product) and provide employment at least 55-60% of the population. Due to the agricultural production huge amount of wastes like crop residues, weeds cover, leaf litter, saw dust, rice husk, bamboo leaf ash, are available. Black cotton soil is found in Deccan Trap plateau, between 73°80" East longitude and 15° to 24° North latitude. Thus, most of soil in and around Mumbai, Madras, Gwalior, Khandwa, Indore, Nagpur and even some on the river valley of Narmada, Tapi, Godavari and Krishna. And it is a good for for cotton production. so usually called as black cotton soil. It also known as Dark earth, Dark cracking soil, regular and expansive soil and "Kali Mitti" as in local language bangur and khadar in himalya region. The montmorillonite in clay mineral of black cotton soil and high clay are responsible for water-attracting or water holding of these soils. The formation of Black Cotton Soil (BCS) due to rock weathering and cooling of lava which comes from volcanic irruption. Black cotton soil is highly sensitive of moisture, it expand when it comes in contact with water and shrink when its moisture content is removed. If soil changes his volume generally we can say that it's expansive soil. This soil effect in construction of any superstructure and substructure stability on bcs. So it is essential for site engineer to appropriately identify and characteristic merit and demerit of such soil. Expansive soil swell by absorption of water during raining season and shrink in summer season when water is evaporated. In this bcs superstructure Like multi storied building, dam, bridges, retaining structure, pavement roadway etc are damaged due to the settlement of soil subgrade they make small and deep settlement in structure. the settlement leads to causes of crack, uniform settlement, tipping settlement, differential settlement. etc Rice husk constitutes about 20% of the weight of rice and its composition is as follows: cellulose (50%), lignin (25%–30%), silica (15%–20%), and moisture (10%–15%). Bulk density of rice husk is low and lies in the range 90–150 kg/m³.

Rice husk ash has many applications due to its various properties. A pozzolanic is a powder material, which when added to the cement in a concrete mix reacts with the soil. Bamboo leaf is a waste material which easily available on forest villages and paper industries so we used it on the field to improve the quality or engineering property of bcs. The use of bamboo leaf ash as supplement which reduced construction cost and environmental point of view with

production and waste pollution caused by bamboo leaves.

TABLE 1 COMPOSITION OF RHA

Chemical composition	Rice husk ash
SiO₂ (%)	93.0
Al₂O₃ (%)	0.17
Fe₂O₃ (%)	0.35
SiO₂ + Al₂O₃ + Fe₂O₃ (%)	93.5
SO₃ (%)	0.11
CaO (%)	0.91
MgO (%)	0.42
Na₂O (%)	0.63
K₂O (%)	2.82
LOI	4.70

III. MATERIALS

- BCS (Black cotton soil)
- RHA (Rice husk ash)
- BLA (Bamboo leaf ash)

IV. METHODOLOGY

The aim of experiments to identify the properties of black cotton soil enhance by using stabilization materials like Bamboo leaf ash, and Rice husk ash. To determine the engineering properties of black cotton soil liquid limit, plastic limit, DFS (Differential free swell test) shrinkage limit.

List of experiment perform-

- Specific gravity test (IS-2720-PART 3) 1980
 - Liquid limit test (IS: 2720 PART 5) 1985
 - Plastic limit test (IS: 2720 PART 5) 1985
 - Shrinkage limit test (IS-2720-PART-6) 1972
 - DFS (Differential free swell) test (IS: 2720 PART- XL)-1977

V. SAMPLE PREPARATION

For experimental study sample preparation BCS (Black cotton soil) mix with different % of RHA (Rice husk ash) and BLA (Bamboo leaf Ash).

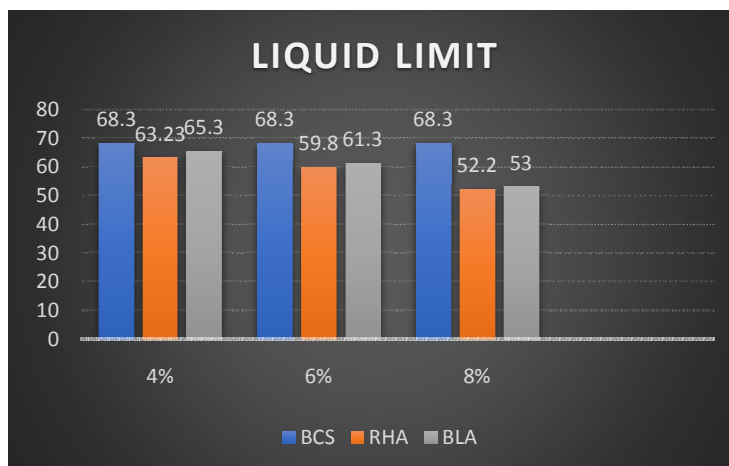
- The expansive soil (Black cotton soil) mixes with RHA (Rice husk ash) 4%RHA+BCS 6%RHA+BCS and 8%RHA +BCS.
- For BLA (Bamboo leaf ash) mix with Black cotton soil 4% BLA, 6% BLA and 8%BLA.
- All experiments are performed according to IS code specification.

A. LIQUID LIMIT TEST

Liquid limit of BCS (Black cotton soil) is 68.3%. In 4% of RHA liquid limit of Black cotton soil 63.23 %. In 6% of RHA liquid limit of Black cotton soil 59.8% and 8% of RHA liquid limit of black cotton soil 50.2%. With increasing % of RHA in black cotton soil liquid limit of black cotton soil is decreasing. When BLA (Bamboo leaf ash) (4%, 6%, 8%) mix with black cotton soil liquid limit also decrease. In 4% of BLA liquid limit of Black cotton soil 65.3 %. In 6% of BLA liquid limit of Black cotton soil 61.3% and 53% in 8% of BLA

Table 2 Liquid Limit of Bcs Rha And Bla

Sample	Liquid limit
BCS	68.3%
BCS+4%RHA	63.23%
BCS+6%RHA	59.8%
BCS+8%RHA	52.2%
BCS+4%BLA	65.3%
BCS+6%BLA	61.3%
BCS+8%BLA	53.00%



Graph 1 Liquid Limit of Bcs With Rha and Bla

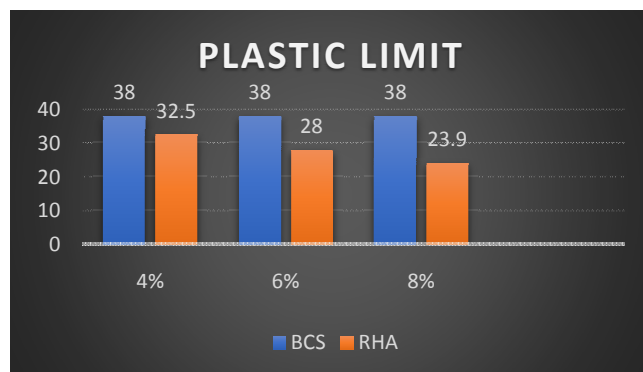
B. PLASTIC LIMIT TEST

When RHA (4%, 6%, and 8%) mix with black cotton soil plastic limit is decrease with increasing % of RHA in black cotton soil plastic limit of black cotton soil is decreasing. In 4% of RHA Plastic limit of Black cotton soil 32.5%. In 6% of RHA plastic limit of Black cotton soil 28.00% and 8% of RHA plastic limit of black cotton soil 23.9%. When BLA (Bamboo leaf ash) (4%, 6%, 8%) mix with black cotton soil plastic limit also decrease. In 4% of BLA plastic limit of Black cotton soil 34.0%. In 6% of BLA plastic limit of Black cotton soil 30.5% and 8% of 25.17%

Table 3 Plastic Limit Of Bcs With Rha and Bla

Sample	Plastic limit
BCS	38.00%
BCS+4%RHA	32.5%
BCS+6%RHA	28.00%
BCS+8%RHA	23.9%
BCS+4%BLA	34.00%

BCS+6%BLA	30.5%
BCS+8%BLA	25.17%



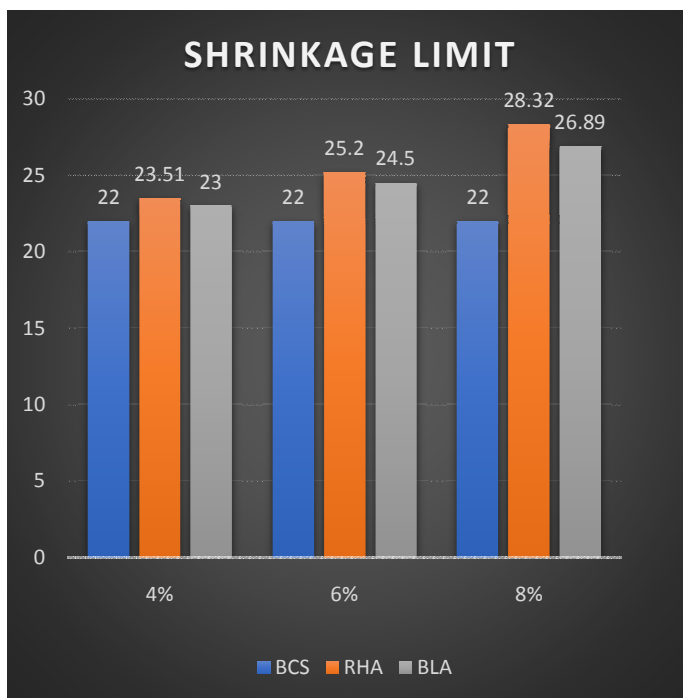
Graph 3 Plastic Limit Of Bcs With Rha and Bla

C. SHRINKAGE LIMIT TEST

When RHA mix with BCS shrinkage limit is increase Soil particle make bond between RHA particle because its pozolanic behavior and BLA (Bamboo leaf ash). Result show that RHA and BLA treated soil absorb more water to change it semi solid state to solid state. Loss of moisture will not result in any more volume reduction.

Table 4 Shrinkage Limit Of Bcs With Rha And Bla

Sample	shrinkage limit
BCS	22%
BCS+4%RHA	23.51%
BCS+6%RHA	25.2%
BCS+8%RHA	28.32%
BCS+4%BLA	23.00%
BCS+6%BLA	24.5%
BCS+8%BLA	26.89%



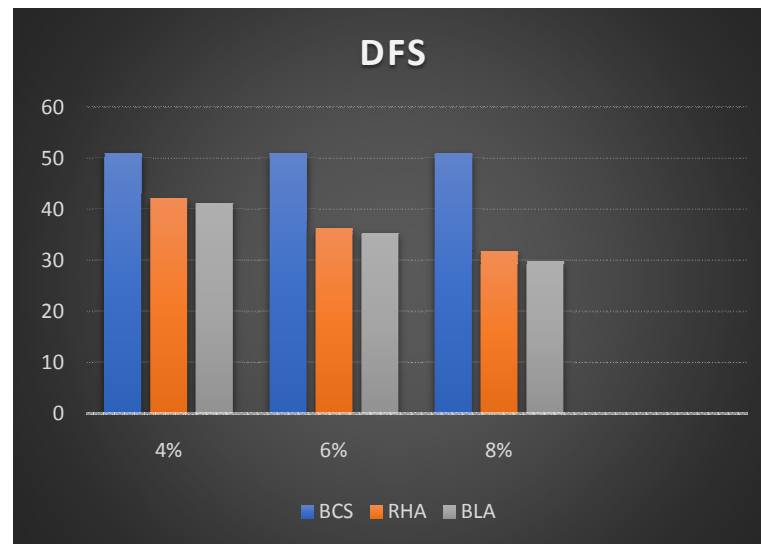
Graph4 Shrinkage Limit Of Bcs With Rha And Bla

D. DFS (Differential free swell) Test

To determine the shrinkage limit of the soil the value of shrinkage limit is used for understanding the swelling and shrinkage properties of cohesive soils. It is used for calculating the shrinkage factors which helps in the design problems of the structures made up of the soils or/and resting on soil. It gives an idea about the suitability of the soil as a construction material in foundations, roads, embankments and dams. DFS test result show that swelling of black cotton soil is decreasing with increasing the % of RHA, and BLA in reinforced soil. RHA 4% swells 42%, in 6% swelling 36.31% and in 8% swelling result 31.70%. BLA (Bamboo leaf Ash)

Table 5 Dfs Of Bcs With Rha And Bla

Sample	DFS%
BCS	51%
BCS+4%RHA	42%
BCS+6%RHA	36.31%
BCS+8%RHA	31.71%
BCS+4%BLA	41.2%
BCS+6%BLA	35.3%
BCS+8%BLA	29.8%



Graph 5 Dfs Of Bcs With Rha And Bla

VI. CONCLUSION

The results show that engineering properties of Black cotton soil is enhancing using stabilization by RHA PPF BLA.RHA (Rice husk ash) and BLA (Bamboo leaf ash) pozzolanic material in black cotton soil and make strong bond between black cotton soil particles and RHA Bamboo leaf ash particles .these bonds responsible to increasing properties of black cotton soil.

1 liquid limit of black cotton soil is decreasing when add RHA in increasing % and BLA

2 plastic limit of black cotton soil is also decreasing when add increasing % of RHA and BLA

3 for shrinkage limit of black cotton soil is increasing when increasing a % of RHA and BLA

4 In Differential free test of black cotton soil swelling is decreasing with increasing % of RHA and BLA

5 The results show that engineering properties of black cotton soil is enhancing using stabilization by RHA and BLA

VII. REFERENCE

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