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Soil Stabilization of Expansive Soil with the Rice Husk Ash and Bamboo Leaf Ash

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ABSTRACT

In construction on black soil is much more difficult in India it cover 20% of total land area of india and 47% cover land area in madhyapradesh specially in malwa region. It swell during raining season and shrink in summer when moisture content is differ . In this soil , structure damaged by settlement of soil (expansive soil).for ractify to these problems we use siol stabilization method . Using RHA, and bamboo leaf ash with 4% 6% 8% (RHA ,BLA) mixing with black cotton soil. So some test is performed and getting better result which help In stabilization like Permeability of black cotton soil is decreasing with increasing % of Rice husk ash. OMC and MDD of Expansive soil (black cotton soil) with RHA and BLA OMC is decreasing and MDD is increasing with increasing % of RHA and BLA in Expansive soil. UCS of black cotton soil increasing with increase % of RHA and BLA.

Keywords: RHA, BLA (Bamboo Leaf ash) OMC, MDD, UCS

INTRODUCTION

Expansive soil changes his volume contact with moisture generally we can say that its expansive soil. This soil affected in constriction of any superstructure and substructure stability on expansive soil. Hence itbecomeveryessentialforGeotechnicalengineertoappropriatelyidentifyandcategories suchsoil. Geotechnical engineer addresses application of soil mechanics and rock problem .so examine the nature of soil and resolution of expansive soil. Engineering structure like residential ,service building ,bridge dam, roadways airport etc are based on soil strata. some land slide hilly area and wall demolilition structure failure are result of defferential settlement In example of soil settlement is " Pisa tower '' of ITALY constructed started in 1173 and take 200year for completion leaning continuously during and after of construction in 1982 height was 58.4m with deviation with 5.6m now its height is 57m . Agriculture wastes use to improve properties of expansive soil. Rice husk is usable as construction material due to its various properties. A rice husk ash is pozzolanic powder material, when added to the cement in during concrete mix reacts with the lime, released hydration of the cement, and create compounds which improve the strength and properties of the concrete . RHA is highly pozzolanic material contains crystalline silica and high specific surface area that are responsible for high pozzolanic reactivity. In Present case bamboo leaf ash is behave like pozzolanic material . Some study about bamboo leaf ash it can act as a stabilizer to the expansive soil. This pozzolanic and cementations properties of bamboo leaf ash used to improve the strength of black cotton soil as the soil stabilizer.

METHODOLOGY

List of experiment perform

- Permeability test
- Standard proctor compactiontest
- UCS (unconfined compressive strength)test
- CBR test

- ***Permeability test***

  IS 2720-17 (1986): Methods of test for soils, Part 17. This test is used for fine grained soils with intermediate and low permeability such as silts and clays. To determine the coefficient of permeability of a given soil sample by falling head permeability test. The passage of water through porous material is called seepage. A material with continuous voids is called a permeable material.

  Coefficient of permeability k = ((2.3 * a * L)/(A*t))*log10(h1/h2).

- ***Standard proctor compactiontest***

  The experiment is conducted as per IS 2720-7(1980). To determine moisture content and dry density relationship by standard proctor test. Compaction is the application of mechanical energy to a soil so as to rearrange its particles and reduce the void ratio. it is applied to improve the

properties of an existing soil or in the process of placing fill such as in the construction of embankments, road bases, runways, earth dams, and reinforced earth walls. Compaction is also used to prepare a level surface during construction of buildings.

- ***UCS (unconfined compressive strength)test***

The test is conducted as per IS 2720-10 (1991).To determine the unconfined compression test of soil. It is not always possible to conduct the bearing capacity test in the field. The test is performed on a cylindrical sample with a height to diameter ratio of 2: 1. The sample is placed between the plates of a mechanical load frame without any covering or lateral support. Load and deformation readings are noted until the failure of the sample or a strain of 20%, whichever issmaller

- ***CBR***

California bearing ratio test is one of the soil strength evaluation tests. In this test, the relative strength of a soil specimen is measured with respect to the standard sample. In this article, the definition of the California bearing ratio is provided. Also, the required apparatus of the CBR test of soil, full test procedure, the calculation to evaluate California Bearing Ratio, and uses of the test result are explained here.

California bearing ratio is the percentage of stress a soil specimen can resist for a certain amount of penetration relative to the value of stress of which a standard soil could resist. Basically, the value is an indicator of the strength of the soil.

CBR=PsPstd.×100%CBR=PsPstd.×100%

Ps=Stress carried by site soil ·Ps=Stress carried by site soil·

Pstd.=Stress carried by standard soil ·Pstd.=Stress carried by standard soil

RESULTS ANDDISCUSSION

- ***Permeability test***

For expansive soil permeability is decreased when adding % RHA and BLA. The RHA and BLA filled up the pore space in soil sample and increased the bond among soil particles resulting to reduction in the soil permeability. RHA and BLA can be used as material for soil grouting for low permeability property.

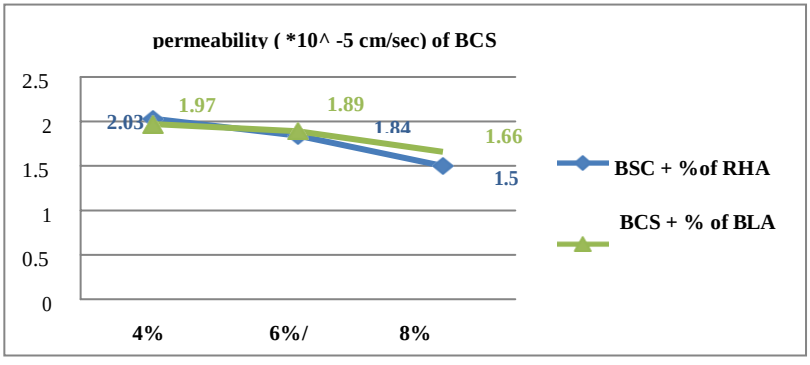
Table 1 permeability of BCS +RHA (4 % 6% 8%)

Samples	**Coefficient of permeability (K)**
BCS + 4% of RHA	2.02*10^ -5 cm/s
BCS + 6% of RHA	1.*10^ -5 cm/s
BCS + 8% of RHA	1.50*10^ -5 cm/s

Table 2 permeability of BCS + BLA (4% 6% 8%)

Samples	**Coefficient of permeability (K)**
BCS + 4% of BLA	1.97*10^ -5 cm/s
BCS + 6% of BLA	1.89*10^ -5 cm/s
BCS + 8% of BLA	1.66*10^ -5 cm/s

Graph 1 permeability Of RHA AND BLA



Standard proctor compactiontes

Expansive soil OMC decreased and MDD is increased with adding % of RHA and BLA. Increasing and decreasing in MDD can be replacement of soil by the RHA and BLA in the mixture which has a relatively low specific gravity compared to that of BCS soil. Increasing in RHA and BLA content in soil reduced plasticity and increased volume stability.

Table 3 OMC AND MDD

Sample	OMC%	MDD gm/cc
BCS	22.95	1.599
4% RHA	21.87	1.636
6% RHA	19.53	1.675
8% RHA	18.81	1.751

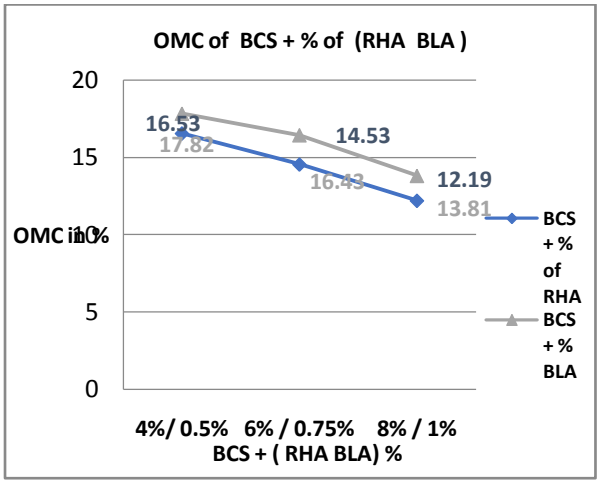
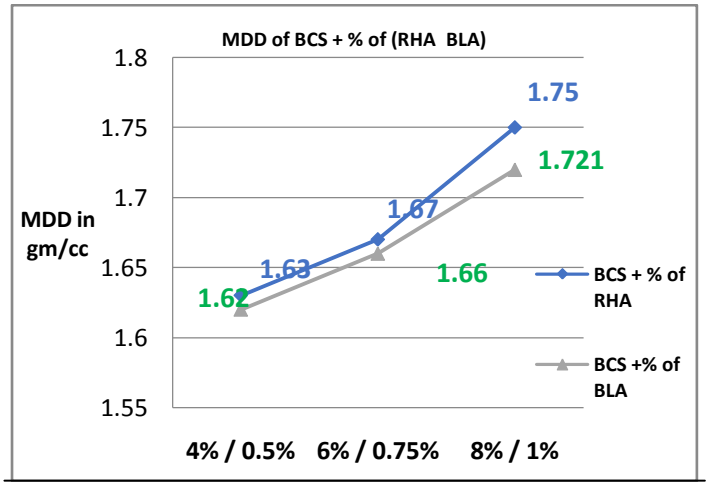


Table 4 OMC MDD of BCS +% ofBLA

Sample	OMC%	MDD gm/cc
BCS	22.95	1.599
4% BLA	21.62	1.626
6% BLA	20.43	1.663
8% BLA	18.18	1.721

GRAPH 2 MDD OF BCS RHA AND BLA



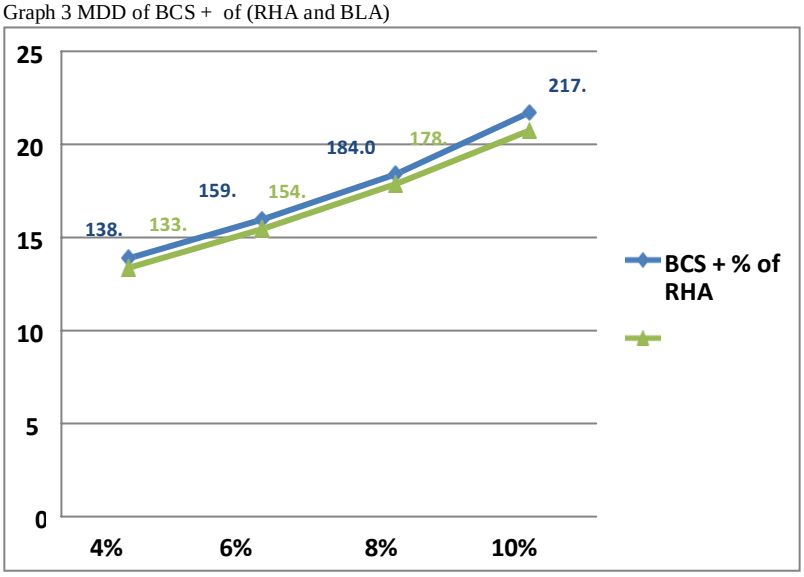
UCS (unconfined compressive strength)test

UCS of Expansive soil in increasing with increasing % of RHA and BLA. Initially the stress is gradually increasing with increasing of strain. At peak stress it decrease with the increase of strain for all the combination of RHA and BLA. Also observed that the failure of the fiber soil specimens occur in longer time than the original BC soil. The result show that increase in UCS is increase ductility of expansive soil.

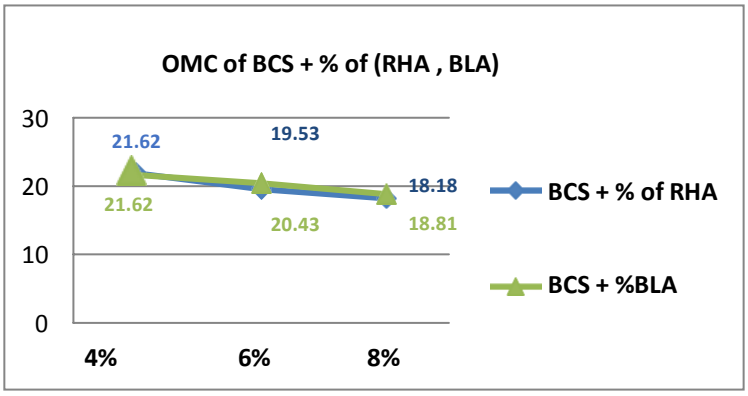
Table 5 UCS of BCS + % of (RHA and BLA)

Sample	UCS (KN/m2
BCS+4%RHA	138.8
BCS+6%RHA	159.7
BCS+8%RHA	184.06
BCS+4%BLA	133.7
BCS+6%BLA	154.5
BCS+8%BLA	178.7

Graph 3 MDD of BCS + of (RHA and BLA)



Graph 4 OMC of BCS +% of (RHA, and BLA)

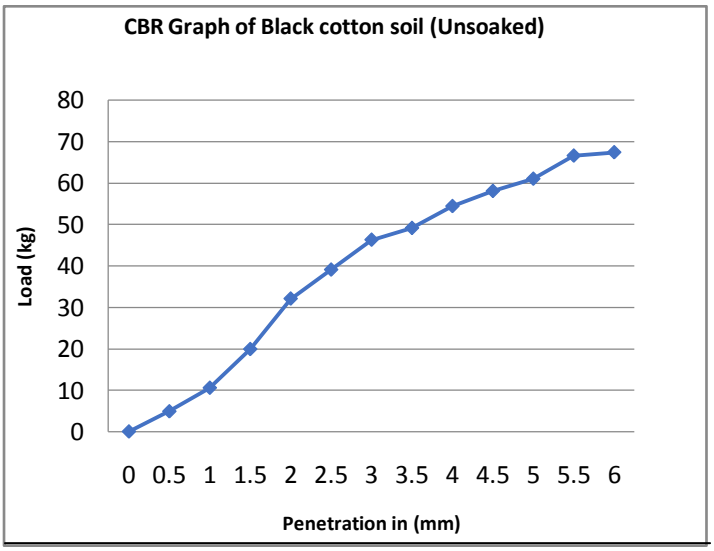


CBR TEST

For unsoaked CBR test

For unsoaked Black cotton soil mixes with different % of Rice husk ash 4% 6% 8% and Bamboo leaf ash (4% 6% 8%). For RHA 4% 6% and 8% CBR% is 3.61, 3.97 and 4.41 is increasing. BLA 4% 6% 8% CBR% is 3.42, 3.81 and 4.13

Samples	CBR % (Unsoaked)
BCS	**3.2**
4%RHA	**3.61**
6%RHA	**3.97**
8% RHA	**4.41**
4% BLA	**3.42**
6%BLA	**3.81**
8% BLA	**4.13**



CONCLUSION

- The results show that engineering properties of Black cotton soil is enhancing using stabilization by RHA BLA. Permeability of black cotton soil is decreasing with increasing % of RHA andBLA.
- OMC and MDD of Expansive soil (black cotton soil) with RHA and BLA OMC is decreasing and MDD is increasing with increasing % of RHA and BLA in Expansive soil.
- UCS of Expansive soil is highly increased with increased % of RHA and BLA (bamboo leafash)
- For Expansive soil BLA (Bamboo leaf ash) is used to new material which can reduce the cost of chemical stabilization infuture
- In CBR test CBR % value of penetration at 2.5mm and 5mm is increasing with increasing % of Rice husk ash and Bamboo leaf ash mix in Black cotton soil. It's enhancing CBR %.
- The results show that engineering properties of Black cotton soil is enhancing using stabilization by RHA and BLA.

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