International Journal of Applied Engineering Research ISSN 0973-4562 Volume 13, Number 7 (2018) pp. 219-223

Experimental Study on Stabilization of Black Cotton Soil with Molasses and Arecanut Fibers

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Abstract
This Paper describes about the exploratory examination on the adjustment of soil utilizing the Byproduct of Sugarcane handling and Areca Nut strands. The Byproduct of Sugarcane preparing thought about was Molasses. The Molasses principally contains Silicon Di oxide, Potassium oxide and Calcium Oxide. Fundamental properties of virgin soil like Atterberg points of confinement, compaction attributes, California bearing proportion, and unconfined compressive quality were resolved. The dirt example was treated with differing rates (2%, 4%, 6%, 8% & 10%) of Molasses and the ideal level of Molasses for the dirt was resolved. The dirt example was again treated with differing rates of Areca Nut strands (1%, 2%, 3% & 4%) and the ideal level of Areca Nut strands for the dirt was resolved. The dirt was then treated with ideal level of Molasses and differing rates of Areca Nut strands. It was watched that the dirt demonstrated impressive quality change with Molasses and Areca Nut filaments. The viable utilization of locally accessible materials like Molasses and Areca Nut strands for the change of soil makes the examination significant and attainable.

Keywords: Areca nut fibers, Molasses, filaments, Areca nut strands, Dirt, Silicon Di oxide, Potassium oxide and Calcium Oxide.

Introduction

Soil adjustment is a strategy used to enhance soil quality, bearing limit and sturdiness under antagonistic dampness and stress conditions. It alludes especially to the blending of the parent soil with other soil, concrete, lime, bituminous items, silicates and different chemicals and common or engineered, natural and inorganic materials. The current patterns on soil adjustment have advanced imaginative systems of using nearby accessible ecological and modern waste material for the change and adjustment of insufficient soil. During the time spent soil adjustment and alteration accentuation is given for most extreme usage of neighborhood material with the goal that cost of development might be limited to the greatest degree. In the meantime safe transfer of horticultural and local squanders wind up testing undertaking for engineers. Consequently an endeavor has been made by analysts to utilize agrarian and local squanders/modern squanders as soil stabilizers. Generation of huge amount of modern squanders everywhere throughout the world prompts significant issues of taking care of and transfer. Safe transfer of mechanical squanders without unfavorably influencing the earth and the huge stockpiling zone required to dump the waste are real concerns. The transfer of rural squanders makes a potential negative effect on the earth causing air contamination and water contamination influencing the nearby biological communities. Subsequently, safe transfer of rural squanders turns into a testing undertaking for engineers. In this task, an endeavor has been made to explore the achievability of utilizing one of the waste item 'Molasses' and „Areca Nut strands‟ to balance out a frail soil that is 'Black Cotton Soil'.

Materials and Methodology

Materials

- Black cotton soil
- Molasses
- Areca Nut fibers

Black Cotton Soil

BC soil or extensive soil is otherwise called swelling soil. This kind of Black soils will found in Central states and a few areas of south India. The presence of this sort of soil is Black, subsequently they are called as Black cotton soils. This BCS are particularly helpful for developing Cotton. The BCS utilized as a part of this work is taken from Harihara in Davanagere District. The Expansive soil utilized as a part of this work this work is taken from 1.5m underneath the current ground level.

Black cotton soil

Sl.No	Properties	Results
1	Initial moisture content	10%
2	Specific Gravity(G)	2.65
3	Percentage of Gravel	2
	Percentage of Sand	8
	Percentage of Silt	25
	Percentage of Clay	65
4	Liquid Limit(W_L)	69.8%
	Plastic Limit(W_P)	29.3%
	Shrinkage Limit(W_S)	8.1%
	Plasticity Index(I_P)	40.5%
5	Soil Classification	CH
6	Optimum Moisture Content	26.32%
7	Maximum dry Density	16.284 KN/m^3
8	Unconfined compressive strength	146.46 KN/m^2
9	CBR Unsoaked	2.02
10	CBR Soaked	1.05

Properties of Black Cotton Soil

Sugar cane Molasses

Molasses a result of Sugar Cane is a thick and dim syrupy fluid acquired in preparing genuine sweetener. "Black Treacle" is an another name of Molasses. It contains resinous and little measure of inorganic constituents that makes it unsuitable for the human use. Molasses is marginally discomforting & sticky when it gets in contact with a people dermis. It is tricky when spilt & can be a cause for street mischance if a noteworthy spill happens out and about. It could cause natural contamination through tasteful corruption if spills are not legitimately cleaned. It can likewise cause water contamination if significant spills or manufacturing plant effluents enter 12waterway streams. It is along these lines vital to consider basically the dealing with and transfer of molasses especially in circumstances where supply surpasses request. This can emerge particularly where mechanical utilization of molasses isn't enhanced. It has been brought from **Maddur** in **Mandya** District.

Constituent	Cane molasses (%)
Water	20
Organic constituents	
Sugars: a) Fructose	16
b) Saccharose	32
c) Glucose	14
Non Sugar :Nitrogenous materials, soluble gummy materials, Free and bound acids .	10
Constituent	**Cane molasses (%)**
Inorganic constituents (ash)	
Silicon-Di-Oxide	0.5
Potassium oxide	3.5
Calcium Oxide	1.5
Magnesium oxide	0.1
Phosphorus Pent oxide	0.2
Sodium oxide	0.2
Iron oxide	
Aluminium oxide	
Sulphate residue(as SO_2)	1.6
chlorides	1.4
Total	100

Average composition of Sugarcane Molasses

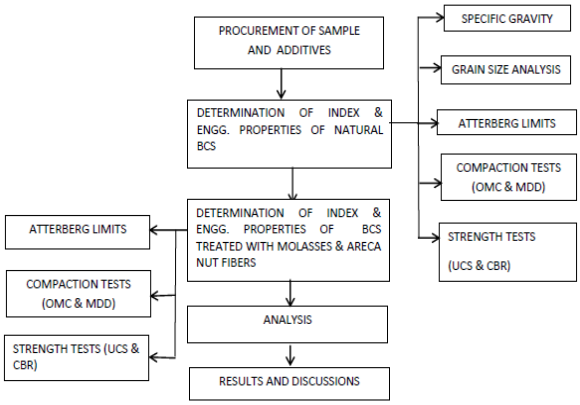
Areca nut fibers

Areca Nut Fibers

Parameters	Units	Values
Shape		Straight, Twisted
Cut length	mm	3,6,12,18,24
Effective diameter	Microns	20-40
Specific gravity		1.32-1.38

Properties of Areca Nut Fibers

Methodology

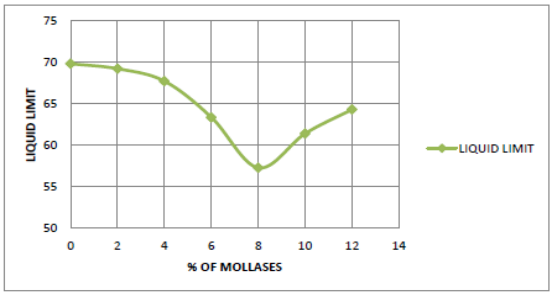


In a research facility as far as possible test is directed on Black cotton Soil by including different rates of Molasses and Arecanut filaments. At first LL, PL, SL test was conveyed for a BCS treated with 2%, 4%, 6%, 8%, 10% and 12 %. To know the compaction attributes of BCS treated with Molasses, the compaction tests was performed at 4%, 6%, 8% and 10% of Molasses. To know the compaction attributes of BCS treated with Areca Nut filaments the compaction tests was performed at 1%, 2%, 3% and 4% of Areca Nut strands. The joined impact of Molasses and Areca Nut filaments on the quality and compaction attributes were controlled by performing compaction test, UCS test and CBR test at various
blend of both the added substances. The outcomes were broke down and the conclusions were made.

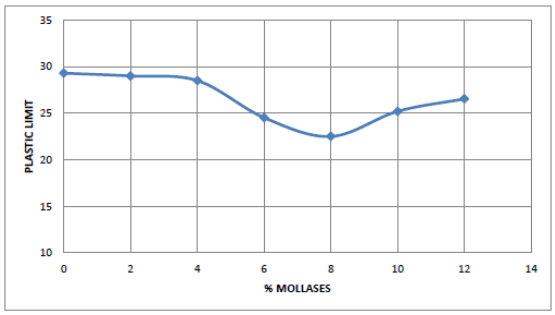
Results and Discussions

I. Effect of Molasses on Black cotton Soil Properties

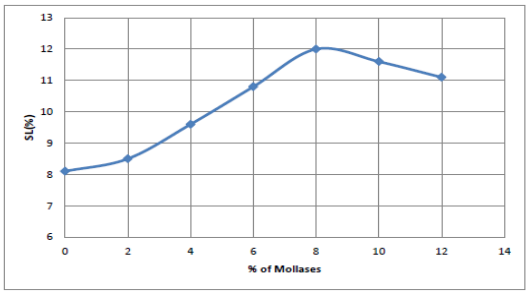
i) Effect of Various % of Molasses on LL



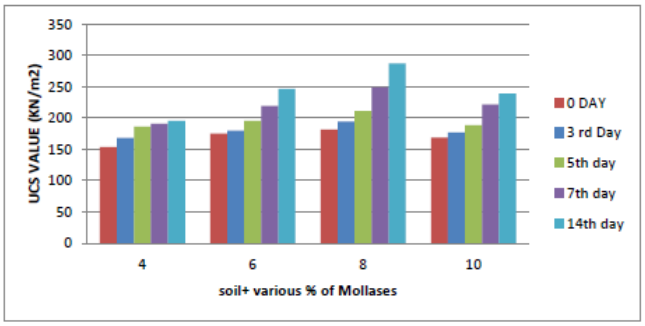
ii) Effect of Various % of Molasses on PL



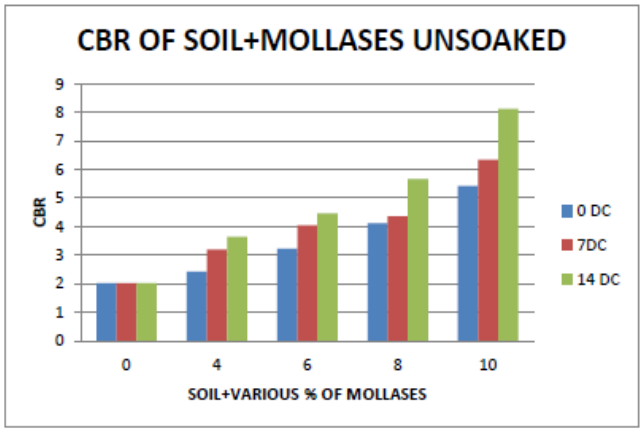
iii) Effect of Various % of Molasses on SL



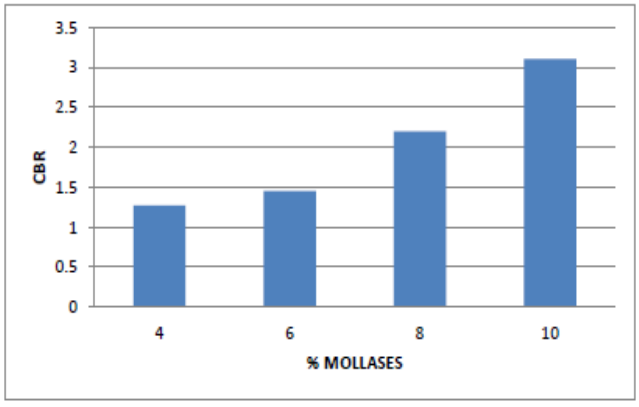
iv) Effect of Various % of Molasses on UCS



v) Effect of Various % of Molasses on CBR- Unsoaked

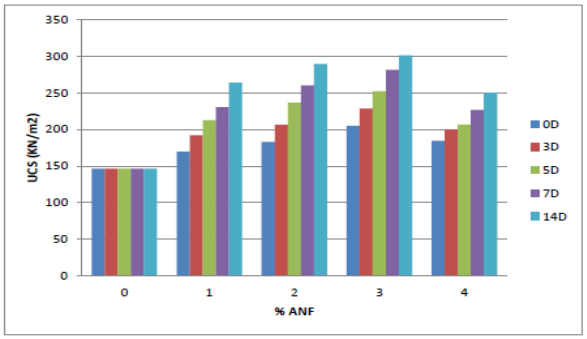


vi) Effect of Various % of Molasses on CBR- Soaked

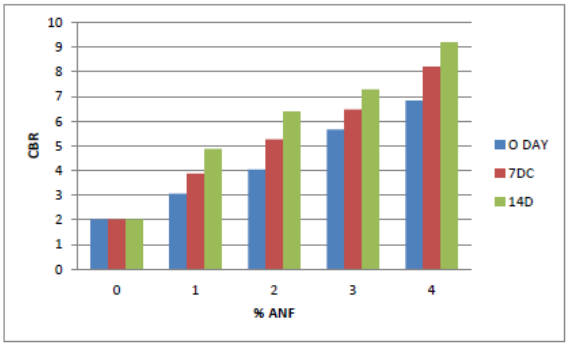


II. Effect of areca nut fibers on strength properties of BCS

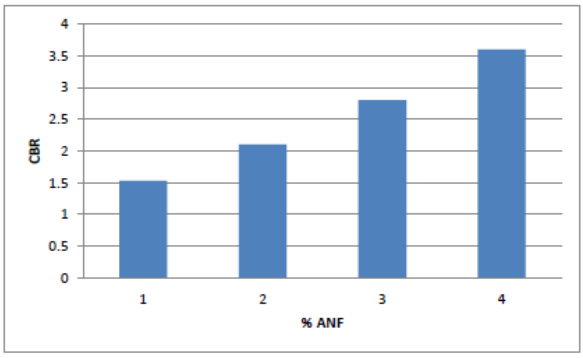
i) Effect of Various % of ANF on UCS



ii) Effect of Various % of ANF on CBR-Unsoaked

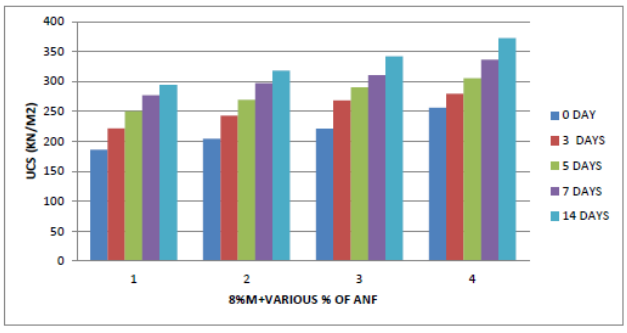


iii) Effect of Various % of ANF on CBR-Soaked

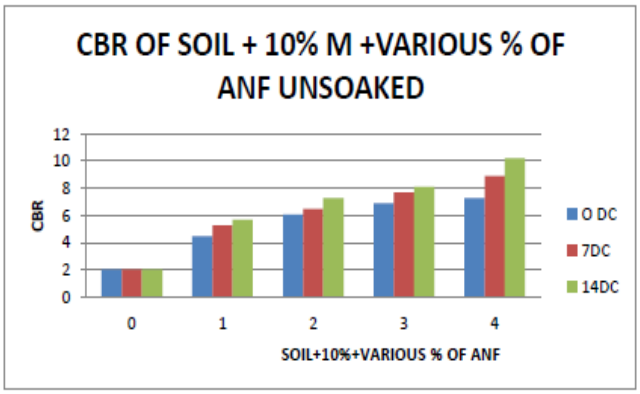


III. Effect of molasses & areca nut fibers on strength properties of BCS

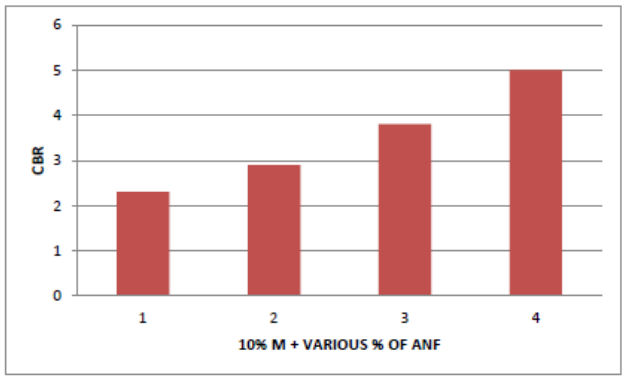
i) Effect of optimum % of Molasses+ various % of ANF on UCS



ii) CBR Results for BCS Treated with MOLASSES+ANF-Unsoaked condition



iii) Effect of Max % Of Molasses+ various % ANF On CBR-Soaked



Conclusions

The index and engineering properties of BCS have been determined. Atterberg Limits were determined for BCS treated with different % of Molasses. It has been found that as the % of Molasses increases the Liquid limit , Plastic limit goes on decreasing up to 8% of Molasses. Beyond 8% the LL, PL goes on Increasing. Shrinkage

Limit goes on increasing with increase in the % of Molasses up to 8% & beyond 8% SL goes on decreases .From this it can be concluded 8% of molasses is optimum to get good result. Compaction Characteristics were determined for BCS treated with different % of Molasses .As the % of Molasses increases OMC goes on decreases and MDD goes on increases. At an optimum 8% of Molasses OMC decreased to minimum and MDD increased to maximum. Strength Characteristics were determined for BCS treated with different % of Molasses by conducting UCS & CBR tests. Max UCS is obtained at an optimum 8% of Molasses at 14 days curing. Max CBR value for unsoaked condition is obtained at an maximum of 10% of Molasses at 14 days curing. Max CBR value for soaked condition is obtained at an maximum of 10% of Molasses for a sample which is soaked for 4 days. It is found that over all geotechnical properties of BCS treated with Molasses increases at an optimum of 8% Molasses. Compaction Characteristics were determined for BCS treated with different percentage of Areca Nut Fibers. As the percentage of ANF increases OMC goes on decreases and MDD goes on increases. At an

optimum 3% of ANF OMC decreased to minimum and MDD increased to maximum. Strength Characteristics were determined for BCS treated with different percentage of Areca Nut Fibers by conducting UCS & CBR tests. Max UCS is obtained at an optimum 3% of ANF at 14 days curing. Max CBR value for unsoaked condition is obtained at an 49 max 4% of Molasses at 14 days curing. Max CBR value for soaked condition is obtained at an max 4% of ANF for a sample which is soaked for 4 days. It is found that Strength properties of BCS treated with ANF increases at an optimum 3%-4% of ANF. Compaction Characteristics were determined for BCS treated with Optimum 8% of Molasses & by varying percentage of Areca Nut Fibers. As the percentage of ANF increases OMC goes on decreases and MDD goes on increases. At an optimum (8% of Molasses + 4% of ANF) OMC decreased to Min and MDD increased to Max. Strength Characteristics were determined for BCS treated with 8% Molasses & different percentage of Areca Nut Fibers by conducting UCS & CBR tests. As the percentage of Areca Nut Fibers increases UCS goes on Increases. At an optimum (8% of Molasses + 4% of ANF) UCS increased to Max at 14 days curing. Max CBR value for unsoaked condition is obtained at an optimum (10% of M+ 4% of ANF) at 14 days curing. Max CBR value for soaked condition is obtained at an optimum (10% of M+ 4% of ANF) for a sample which is soaked for 4 days. It was likewise watched that molasses contained real mineral components which are dynamic in causing substance response including cation exchange. Molasses included components, for example, Ca, Mg and K. These components are known to respond so effectively with Black cotton soils to achieve adjustment.

Acknowledgement

I would like to take this opportunity to show my gratitude to various eminent personalities, without whose constant encouragement, this endeavor of us would not have become a reality.

I take this opportunity to thank Head and Principal Department of Civil Engineering, East West Institute of Technology, Bengaluru for their wholehearted cooperation and for providing all the required facilities and their support in accomplishment of this dissertation.

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