

STABILISATION OF BLACK SOIL USING TAMARIND KERNEL POWDER AND BANANA LEAVE ASH

¹V.Tanuja, ²K.Saroja Rani, ³M. Chiranjeevi Reddy

¹Assitant Professor, ²Associate Professor, ³UG Student

¹Civil Engineering Department,

¹VSM College of Engineering. Ramchandrapuram,India

Abstract : Soil is a base of the structure from beneath to distribute the load effectively. If the stability is not adequate the failure of structure occurs by settlement, cracks etc., Black Cotton soil is also called Regur Soils (or) Expansive Soils these are generally clayey, deep and impermeable. These soils expand and become sticky during rainy season and contract during the summer season causing deep cracks. Stabilization can improve the load bearing capacity of a sub-grade to support pavement and foundation.

In the present analysis the black cotton soil is stabilized with Tamarind Kernel powder and Banana leaves ash in different proportions to increase the strength characteristics by standard proctor test and Unconfined compression test.

Index Terms – Regur soil, Expansive soil, Impermeable, Deep cracks, Tamarind Kernel powder, Banana leaves ash.

I. INTRODUCTION

Black cotton soils are spread over 5.46 lakh sq km (i.e 16.6 percent of the total geographical area of the country) encompassed between 15° N to 25° N latitudes and 72° E to 82° E longitudes. These soils are mainly found in Andhra Pradesh, Madhya Pradesh, Maharashtra, Gujarat and Tamil Nadu. Expansive soil is a term generally applied to any soil or rock material that has a potential for shrinking or swelling under changing moisture conditions (Nelson and Miller, 1992). Severe damages occur to structures like light buildings, pavements, retaining walls, Canal beds and linings etc., founded on the expansive soils. Soil stabilization may be defined as any which a soil material is improved and made more stable resulting in improved bearing capacity, increase in soil strength, and durability under adverse moisture and stress conditions (Joel and Agbede, 2011).

In the present experimental study the aim is to influence of banana leaves ash and tamarind kernel powder of 2, 4, 6, 8 percentage by dry weight of soil are considered on engineering properties of problematic black cotton soil such as proctor's compaction and Unconfined compressive strength.

LITERATURE REVIEW:

R Devaswara, S Barth, BV Basavaraj, V Madhavan (2010) The tamarind seed polysaccharide possesses properties like high viscosity, broad ph tolerance, no carcinogenicity, musco adhesive nature, and biocompatibility. Since suspensions are thermodynamically unstable, it requires a suspending agent which reduces the rate of settling and permits easy redispersion of any particulate matter.

Marthog, C,Girisha,C. (2012) The use of banana leave ash is sustainable and effective material an order to minimize the use and reduce the construction cost. By using waste product, it also can lead to environmental friendly because it helps in reducing the production of carbon dioxide gases which will contribute to air pollution. Agriculture waste material usually disposed into landfill or dispose by open burning.

Rodrigo C.K etl.al,(2014) The use of banana leaves ash can reduce the consumption of cement nearly 8 to 10 percent. This research has been done by previous researcher by using mineral admixture. Banana leave ash has proved to be technically feasible to improve soil performance, save cost and decrease the environmental impact.

II. MATERIALS

In this study, black cotton soil is a highly clayey soil. The black color in black cotton soil (BC soil) is due to the presence of titanium oxide in small concentration. Expensive soils are the soil. This expands when the moisture content of the soils is increased. The black cotton soils has high percentage of clay, the clay mineral montmorillonite is mainly responsible for expansive characteristics of the soil.

Soil: The soil sample used in present investigation is collected from Korangi at a depth of 2m from ground level of east Godavari district. The sample was collected and tested in the laboratory for the geotechnical characteristics of soil.

Tamarind kernel powder: It has excellent water absorption property and high viscosity as well due to its rich content of carbohydrates and proteins tamarind kernel powder is also used in producing adhesives.

Banana leaves ash: Banana leave ash can be classified to have cementitious properties. It is a part of component material instead of using banana trunk. It is also pozzolanic material in civil engineering construction with several benefits such as low cost and gives equivalent reduction to environmental impact.

III. Test and results:

To study the geotechnical characterization of black cotton soil in korangi was collected at a depth of 2m from the ground level and the collected sample was dried and tested for grain size distribution, plasticity, compaction and strength characteristics as per IS2720

Table:3.1 Geotechnical Properties of Soil

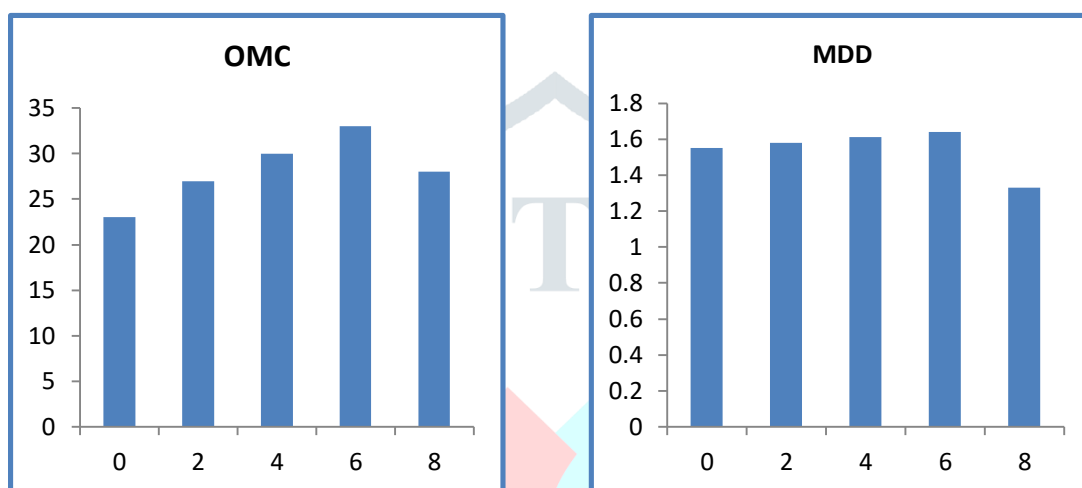
S.NO	Description of the Property	Values
Graduation Properties		
1	Gravel content (%)	0
	Sand content (%)	13.6
	Fines (%)	86.4
Index Properties		
2	Liquid limit (%)	84
	Plastic limit (%)	50
	Plasticity index (%)	34
3	Differential free swell index (%)	135
4	Specific gravity	1.56
Compaction characteristics		
5	Optimum moisture content (%)	23
	Maximum dry density (g/cc)	1.55
Strength parameters		
6	Unconfined compressive test(kpa)	63.5
	California bearing ratio 2.5 mm penetration	2.18

1. Grain size analysis test was conducted as per IS2720, in this fine particles (less than 0.075mm) are dominated by 86.4%.
2. It is also identified that liquid limit value was 84% and plasticity index was 34.
3. The differential free swell of the black cotton soil was 135% it represents the soil was very expansive in nature.
4. The maximum dry density of the soil was 1.55g/cc and the corresponding OMC value was 23%

3.2 COMPACTION CHARACTERISTICS FOR DIFFERENT PERCENTAGES-TKP&BLA

Compaction is a process by which the soil particles artificially rearranging and packed together in to a closer state of contact by mechanical means in order to decrease the porosity of the soil and thus increase its dry density.

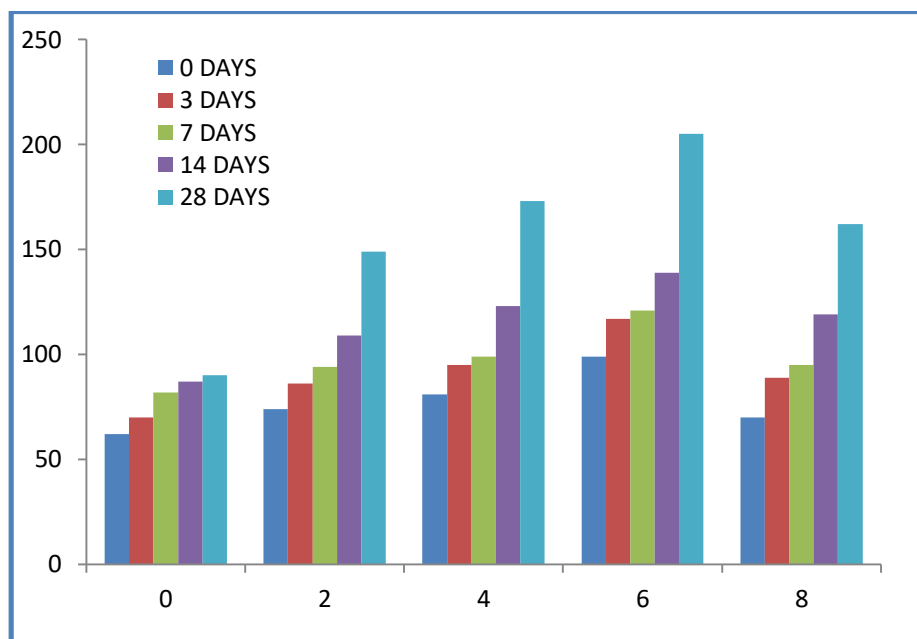
S.No	Percentages of admixture (%)	OMC (%)	MDD (g/cc)
1	0	23	1.55
2	2	27	1.58
3	4	30	1.61
4	6	33	1.64
5	8	28	1.33



Compaction characteristics of stabilized soil are determined by conducting the IS light compaction test. The variation of maximum dry density with varying percentages of tamarind kernel powder and banana leaves ash added to black cotton soil. It can be observed that the maximum dry density of black cotton soil increased from 0% admixture to 6% admixture and there after it decreased.

3.3 Unconfined Compression Test TKP&BLA

S.NO	Percentages of admixture (%)	0 DAYS	3 DAYS	7 DAYS	14 DAYS	28 DAYS
1	0	62	70	82	87	90
2	2	74	86	94	109	149
3	4	81	95	99	123	173
4	6	99	117	121	139	205
5	8	70	89	95	119	162



Compressive strength due to addition of different % of Tamarind kernel powder and banana leave ash. From the graph it is clear that the compressive strength increase with the percentage of admixture. The compressive strength increased from 0% to 6% of the admixture further the decrease of strength is observed.

Conclusion:

Based on the various laboratory test as per IS standards for the black cotton soil by varying the composition the following conclusion are drawn.

1. The increase in the clay content and liquid limit in the black cotton soil attributes an increase in the plasticity index.
2. Compressive strength of the soil increases with the increase in admixture for the effect of the stabilization.

Reference:

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