



Stabilization of Black Cotton Soil by Using Tamarind Seed Powder

Prof. Mohd Azaz¹, Dhanshree Madankar², Runali Shingne³, Abdul Aziz⁴, Abhishek Madne, Musharif⁵

¹Assistant Professor, Department of Civil Engineering & Technology, Anjuman College of Engineering and Technology, Nagpur, Maharashtra, India

²⁻⁵UG Scholar, Department of Civil Engineering & Technology Anjuman College of Engineering and Technology, Nagpur, Maharashtra, India

ABSTRACT

The purpose of this research is to improve the engineering properties of expansive soil by using tamarind seeds. The expansive soil is most likely to be unsaturated and has montmorillonite clay materials. The black cotton soil is mostly present in region around Mumbai, Madras, Nagpur and even on the river banks. The various tests are performed on soil to evaluate their engineering properties for increasing strength of soil by using tamarind seed powder. Like liquid limit and plastic limit are performed on the soil samples by using tamarind seed powder with black cotton soil at the different percentage. The tamarind seed powder are used to improve the strength of black cotton soil. Soil proportion changes depending upon their constituent our water content, density, sieve analysis etc. Experimental work is based on different percentage of tamarind seed in soil on further test for soil liquid, plastic limit, grain size analysis etc. Problems identified with black cotton soil.

Keywords : Black Cotton Soil, Tamarind shells.

I. INTRODUCTION

Black cotton soil also known as expansive soil, is one of the most challenging soil for engineers because of their swelling and shrinking property due to variation in moisture content. It has a low bearing capacity, low shearing strength and high compressibility. Foundation of any structure depend on type of soil. Soil property changes depending on their constituents. The civil structures are needed to construct over the soils. The soil which is unable to provide the desired properties to civil structures for the construction in such cases stabilization is the only method to get the desired properties of soil.

STABILIZATION & IT'S EFFECTIVENESS

Stabilization is the process of blending and mixing materials with a soil to improve certain properties of the soil. The process may include the blending of soils to carry out a desired gradation or the mixture of commercially available additives that may change the gradation, texture or plasticity, or act as a binding for cementation of the soil. Pavement design is based on the premise that minimum specified structural strength will be achieved for each layer of material in the pavement system. Each layer must resist shearing, avoid excessive deflections that sources fatigue cracking within the layer or in overlaying layers and prevent excessive permanent deformation through

densification. As the quality of a soil layer is increased, the ability of that layer to distribute the load over a greater area is generally increased so that a deduction in the required thickness of the pavement layers may be permitted.

In this project stabilization has been done using tamarind seeds powder to improve the strength of the black cotton soil. Tests were performed to evaluate index and engineering properties

II. MATERIAL

A. Black Cotton Soil

Black cotton soils are the major form of soil groups found in India, and cover approximately 20% of the total area and found in most of the places. Most commonly founded in the central and western parts of India this includes the Maharashtra, Madhya Pradesh, Gujarat, and some part of Andhra Pradesh.

Black cotton soil is a type of problematic expansive soil which causes many problem in the construction of structure founded on them.

It is having a swelling and impervious nature with poor geotechnical sub-grade characteristics. As we know in Maharashtra, there is abundance of black cotton soil, so there is need to overcome the problems that are causing damage to the structure.



Fig 1. Black cotton soil

B. Tamarind peels powder

Tamarind is a hardwood tree known scientifically as *Tamarindus indica*. It's native to Africa but also grows in India, Pakistan and many other tropical regions. The tree produces bean-like pods filled with seeds surrounded by a fibrous pulp. An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it.



Fig 2 Tamarind peels powder

III. RESULTS AND DISCUSSION

The following tests were performed on the soil.

A. Moisture content of in-situ black cotton soil.

It was found to be 21.05%

B. Specific gravity of the soil was found to be 2.66.

C. Sieve analysis of black cotton soil is well graded soil.

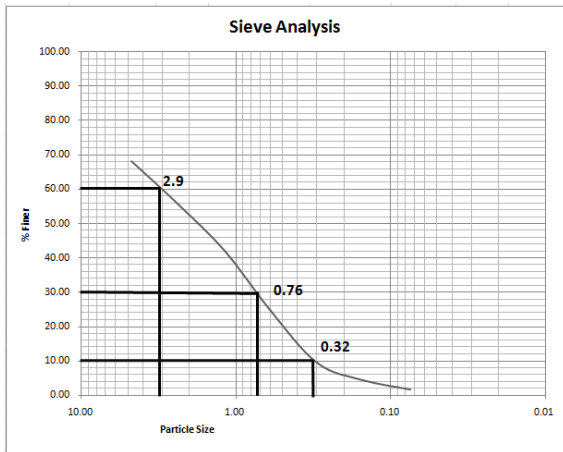


Fig 3 Sieve analysis Graph

D. The table 1 shows the results of Liquid Limit, plastic limit and Plasticity Index.

Description	Black cotton soil	BCS + 2.5% additives	BCS + 5% additive
Liquid limit (%)	45%	26.78	51.05
Plastic limit (%)	16.98%	47.22	31.11
Plasticity index (%)	28.04%	20.44	19.94

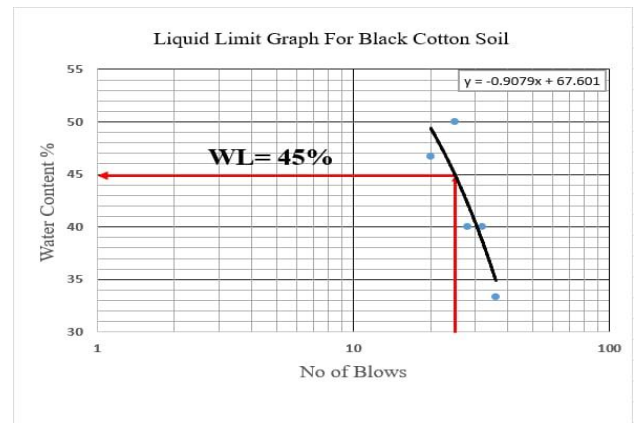


Fig 4 Liquid limit for Black cotton soil

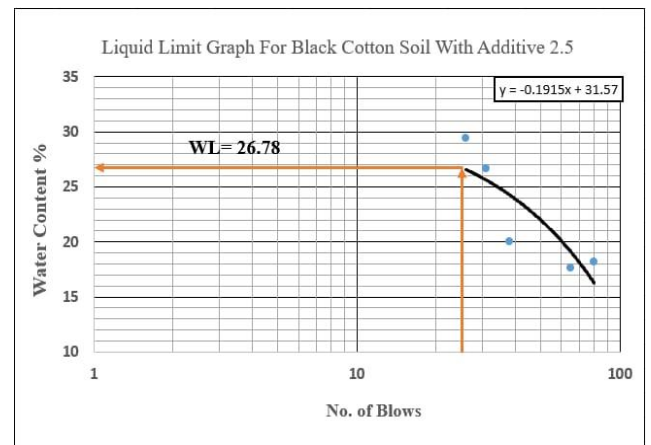


Fig 5 Liquid limit for Black cotton soil with 2.5% additive

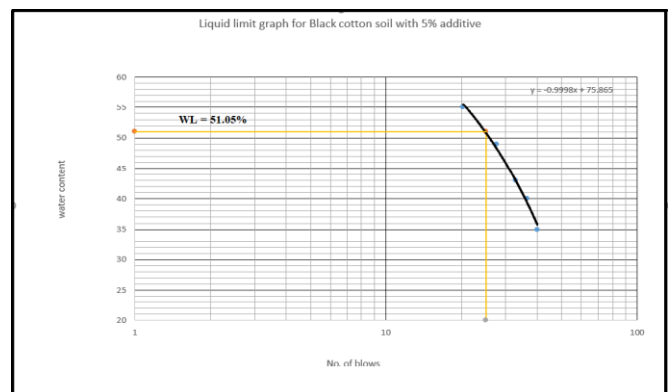


Fig 5 Liquid limit for Black cotton soil with 5% additive

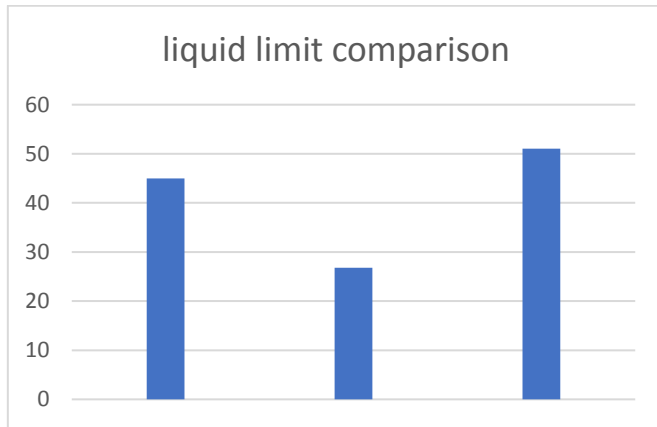
IV. CONCLUSION

The expansive soil was treated with tamarind seed powder to improve its properties. Following

conclusions were drawn based on the results of the tests conducted on Black Cotton soil. The effect of stabilizers varies based on the quantity of Stabilizers that are mixed with the Black Cotton soil sample. Black cotton soil was stabilized with tamarind seed powder with 2.5% and 5%.

V. REFERENCES

- [1]. S. SivaGowriPrasad and P.V.V. Satyanarayana., (2016) "Improvement of Soft Soil Performance using Stone Columns Improved with Circular Geogrid Discs" Indian Journal of Science and Technology, Vol 9(30),
- [2]. Satyanarayana. P. V. V.,et al, (2016) "A Study on the Engineering Properties of Expansive Soil Stabilized with Fly ash and Lime Mixes"(ISSN 2250-2459, ISO 9001:2008 Certified Journal, Vol 6.
- [3]. Ch. Ajay ,and P.M.S.S.Kumar.,(2017) "An Experimental study on Encasement of Stone column with Geo-grid in Clayey Soils". International Journalof Innovative Research in Science, Engineering and Technology Vol. 6.
- [4]. Andrew R. Hind, Suresh K. Bhargava, Stephen C. Grocott (1999) "The surface chemistry of Bayer process solids: a review", Colloids and Surfaces A: Physicochemical and Engineering Aspects, V (146), pp. 359–374.



It was observed that at 2.5% and 5% addition of additive the liquid limit first decreased and then increased respectively.

