International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 03 | Mar 2019 www.irjet.net p-ISSN: 2395-0072

Experimental Investigation of Unstabilized Clay Soil by Groundnut Shell Ash and Bagasse Ash

Balaji. M[1], Dileep kumar. K[2], Gowtham. S[3], Karthikeyan. S[4], Karthick. R[5]

[1,2,3,4]UG Student, Department of Civil Engineering, Valliammai Engineering College, Tamil Nadu, India
[5]Assistant Professor (O.G), Department of Civil Engineering, Valliammai Engineering College, Tamil Nadu, India

---

Abstract - *The most widely used material is soil in the field of Civil Engineering. It is used construction, foundation, bricks, pavements it should provide considerable strength for the stability of the structure. There are different types of soil present in the earth depending upon the material property, size, texture, various properties. Stabilization is one of the method of processing available materials for the production of low-cost road design and construction, the emphasis is definitely placed upon the effective utilization of waste by products like groundnut shell ash and bagasse, with a view to decreasing the construction cost. Groundnut shell ash is added from 2% & 4% by dry weight of soil and bagasse ash as 2% & 4% first of all check the all soil property at 0 % (no GSA & BA) and then compare after addition of GSA & BA. In general, the provision of GSA & BA will reduce the settlement and improves the bearing capacity, which found to be economical techniques among various types of bearing capacity improvement techniques.*

Key Words: clay soil, groundnut shell ash, bagasse ash, stabilization.

1. INTRODUCTION

Soil is a heterogeneous nature, In India, there are many soil conditions in various places. The foundation of building, embankment of soil in reservoir, pavement is an essential part of effective transmission of load to subsoil present it. The quality of soil has large impact on their type of structure and design. The clay soils are examples of weak soil, which participated in foundation engineering, highways, buildings, embankments etc. clay soil undergoes volume changes when they come in contact with water. These type of soil has weak properties due to presence of clayey minerals known as kaolinite, illite, montromorillonite. Today, world faces a serious problem in disposing the large quantity of agricultural and industrial waste. The engineers have to make challenge for safe disposal of agricultural waste. Therefore the addition of bagasse ash to clay soil is attempt to understand the mechanism and the behaviour of clay soil for addition of bagasse ash mixes. Bagasse ash is a industrial waste obtained from the sugarcane industry by burning of sugarcane waste for the purpose of electricity generated for each 10 tons of sugarcane crushed, a sugar factory produces nearly 3 tons of wet bagasse which is a by-product of the sugar cane industry. Same thing, the groundnut shell ash is to addition of clay to stabilize the soil. Groundnut shell ash is also a agricultural waste .Application of solid waste disposal for soil stabilization is significant which serves as various benefits to the environment. This research undergoes use of agricultural waste in stabilizing clay soil and various attempts to have made improve the strength of soil using different chemical additives in combination with lime and cement, but research works to focus more on use of cheaper and locally available material(groundnut shell ash and bagasse ash).

2. MATERIALS USED

2.1 Groundnut Shell Ash

Today, world faces a serious problem in disposing the large quantity of agricultural and industrial waste. The disposal of agricultural waste of groundnut shell without proper attention creates effect on environmental health. groundnut shell is outcome of rice mill and their shell is dried for sunlight and make grinding with shell powder .That powder is perform to burning process. The engineers have to take challenge for safe disposal of agricultural waste. Application of solid waste (Groundnut Shell Ash) disposal for soil stabilization is a significant which serves various benefits to the environment. The term solid waste includes all those solid and semi-solid materials that are discarded by the community.

2.2 Bagasse Ash

Bagasse is a residue obtained from the burning of bagasse for sugar producing factories. Bagasse is the cellular fibrous waste product after the extraction of the sugar juice from cane mills. It is currently used as a bio fuel and the manufacture of pulp and paper products. For each 10 tons of sugarcane crushed, a sugar factory produces nearly 3 tons of wet bagasse which is a by-product of the sugar cane industry. When this bagasse is perform to burning process for the purpose of electricity produces and the resultant ash is bagasse ash. This material contains amorphous silica which is indication of cementing properties, which can develop good bonding between soil grains in case of weak soil.

1.4 Advantages of Stabilization

1. Utilization of locally available materials.
2. Large number of waste materials can be utilized by increasing their strength.
3. Re use of soils considered unsuitable.
4. Savings in disposal of unsuitable materials.
5. Large savings in aggregate consumption.
6. Savings in transportation of material.
7. Protection of roads (less truck transport)

1.5 Applications

1. Road constructions
2. Foundations
3. Dams and reservoirs

1.6 Objectives

1. In this project an attempt is made to study the influence of Groundnut shell ash and bagasse ash on properties of clay soil with increasing percentages 2% &4%.
2. To Study the Strengthening of soil of low bearing capacity.
3. The study of the contribution of Groundnut shell ash and bagasse as Groundnut shell ash and bagasse ash on the properties of clayey soils.

1.7 Scope of the Project

1 There is significant increase in bearing capacity of clayey soil with the inclusion of additives such as Groundnut shell ash and Bagasse ash.

2 Reduces the settlement and improves the bearing capacity, which found to economical techniques among various types of bearing capacity improvement of characteristics.

3 Project focused on effect of Groundnut shell ash and Bagasse ash on bearing capacity and strength. Provision of these reinforced layer increases bearing capacity.

3. LABORATORY INVESTIGATION

3.1 Methodology

Basic laboratory tests (Atterberg's limit, standard proctor compaction, specific gravity, unconfined compression test) were carried out on clay soil sample, and on combination of soil and groundnut shell ash and bagasse ash to determine basic properties of soil sample.

- The stabilization of clay soil with bagasse ash is carried out by blending the soil with their different percentages of groundnut shell and bagasse ash (2%, 4%).
- To determine the strength characteristics of clay soil with groundnut shell ash and bagasse ash, the laboratory tests (standard proctor compaction, unconfined compressive strength) are carried.
- The strength tests are carried out by each percentage of blends. By getting the results of all of these blends the comparison of the proper suitable additive mix will be carried out.
- The comparison and results are concluded.

3.2 Sample preparation

Collected soil sample from the selected site and dried in direct sunlight, the clods are broken to get a uniform sample. The organic matters, small stones, aggregates, wooden material, plant roots or any other substances are removed carefully from soil sample. Sample is kept oven for drying to use in test at temperature 105C to 110C for 24 hrs. The prepared sample is then used for test process.

4. COMPARATIVE STUDY

4.1 Comparative Study of Liquid Limit

Table 1. Liquid limit study

Description	Liquid limit %
Clay	50.16
2% GSA	49.58
4% GSA	38.
2% BA	39.43
4% BA	38.86

4.2 Comparative Study of Plastic Limit

Table 2. Plastic limit study

Description	Plastic limit %
Clay	28
2% GSA	36.1
4% GSA	49.96
2% BA	38.86
4% BA	41.6

4.3 Comparative Study of Proctor Compaction

Table 3. Standard Proctor Test Study

DESCRIPTION	MDD (g/cc)
Clay	1.69
2% GSA	1.74
4% GSA	1.79
2% BA	1.74
4% BA	1.80

4.4 Comparative by Optimum Moisture Content

Table 4. Standard Proctor Test study

Description	OMC %
Clay	12.1
2% GSA	15.08
4% GSA	13.77
2% BA	14.25
4% BA	13.25

4.5 Comparative Study of Unconfined Compressive Strength

Table 5. Unconfined Compressive Test

Description	UCC (Kg/cm²)
Clay	1.09
2% GSA	2.4
4% GSA	2.76
2% BA	3.54
4% BA	2.97

5. CONCLUSION

Every year a lot of agriculture waste is generated and occupied lot of space. It is necessary to find a solution for this problem. From the study, it is observed that there is an appreciable improvement in the optimum moisture content and maximum dry density for the soil treated with groundnut shell ash and bagasse ash. Maximum dry density in Proctor compaction test was 1.80gm/cc at 4% bagasse ash is used as are placement of soil, it reduces the environmental pollution and reduces cost of work. Maximum compressive strength occurred at 2% Bagasse ash as 3.54kg/cm^2.Thus from the above experimental studies we concluded that, Settlement in clay Soil can be reducing by adding a Bagasse ash. This will in turn improve the strength, reduce permeability, increase density and improve shear strength. Thus use of groundnut shell, bagasse ash will be benefited to Black Cotton Soil in improving their Soil Properties. This method of stabilization used to improve the properties of soil.

6. REFERENCES

1. Casagrande, A., "Research on te Atterberg Limits of Soils", Public Roads, Vol. 13, 1932.
2. Casagrande, A., "Classification and Identification of Soils", *Trans.* ASCE, Vol. 113, 1948.
3. S.K. GARG(2008).,SOIL MECHANICS AND FOUNDATION ENGINEERING.
4. K.S. Gandhi., Expansive Soil Stabilization Using Bagasse Ash.
5. Oriola, Folagbade, Moses, George., Groundnut Shell Ash Stabilization of Black cotton Soil
6. IS 2720 (Part 5) -1985 (Determination of liquid and plastic limits)
7. IS 2720 (Part 7) -1980 (Determination of water content-dry density relation using light compaction)
8. IS 2720-10 (Part 10) (Determination of unconfined compression strength).