

# Effect Of Coconut Shell Ash On Properties Of Expansive Soils

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**Abstract** - Black cotton soil deposits in India are a boon to farmers but are problematic to civil engineers. Civil Engineering structures experience large scale damage due to heaving accompanied by loss of strength of these soils during rainy seasons and shrinkage during summer. In India the soil mostly present is Clay, in which the construction of sub grade is problematic. Keeping this in view stabilization of weak soil may be done with suitable admixtures to save the construction cost considerably. Soil stabilization can be explained as the alteration of the soil properties by chemical or physical means in order to enhance the engineering quality of the soil. The main objective of the soil stabilization is to increase the bearing capacity of the soil. The best way to stabilise such type of soil is to disturb the soil sample by physically adding an additive. In the present work an organic waste product which is readily available and is quite effective and cost friendly is used. The material used is the shell of coconut which is easily available waste product in every household. The laboratory investigation has shown that it increases the strength of soil effectively without affecting the foundation of the structure. The test have shown that the material used for stabilization is highly soil friendly and effective for civil engineers who have major problems dealing with expansive soils.

**Key Words:** Stabilisation, Black Cotton Soil, Coconut Shell Ash.

## 1. INTRODUCTION ( Size 11 , cambria font)

Industrial development in India has necessitated construction of infrastructure facility such as highways, airports seaports and residential, commercial buildings. There is a need to select a good soil conditions for proper safety consideration of all these projects. Expansive soil is one among the problematic soils that has a high potential for shrinking or swelling due to change of moisture content. Expansive soils can be found on almost all the continents on the Earth. In geotechnical engineering, soil stabilization or other methods are required when a given site does not have suitable engineering properties to support structures, roads, and foundations. One possibility is to adapt the foundation to the geotechnical conditions at the site. Another possibility

is to try to stabilize or improve the engineering properties of the soils at the site. Several measures such as application of adequate surcharge load, pre-wetting, moisture control, CNS layer technique (Katti, 1979). Chemical stabilization (Snethen et. al, 1979; Ramana Murthy, 1998) was suggested to alleviate the problems posed by expansive soils. The variation in liquid limit, plastic limit, unconfined compression stress (UCS), of expansive soil are presented and discussed.

### 1.1 Sub Heading 1

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## 2. Experimental Investigations

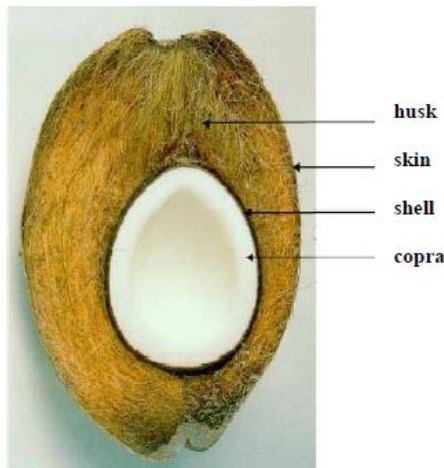
### Material Used

#### Soil

Expansive black cotton soil collected from the neighborhood of Nagpur city was used. Its basic properties are: liquid limit  $w_L = 61\%$ , plastic limit  $I_p = 32\%$ , clay and silt content  $86\%$ , specific gravity = 2.69.

#### Organic Additives Used

Coconut shell covering (In the form of ash).Sample paragraph, The entire document should be in cambria font. Type 3 fonts must not be used. Other font types may be used if needed for special purposes. The entire document should be in cambria font. Type 3 fonts must not be used. Other font types may be used if needed for special purposes.



Different parts of the coconut fruit

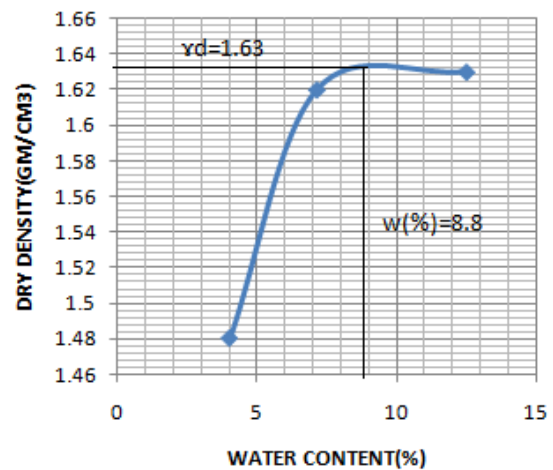


Chart -1: 10% Coconut shell ash.

### 3. Sample Preparation

The behavior of coconut shell ash with soil has been investigated in present paper. Coconut shell ash has been used in percentage by weight of soil. Three different percentages (5%, 10%, 15%) of coconut shell ash has been used by weight of soil. The Maximum Dry Density (MDD) and Optimum Moisture Content (OMC) obtained for different percentages.

### 4. Results And Discussion

The changes of dry density values with different percentages of coconut shell ash mixed in expansive soil are presented in the Fig. 1. It is observed that the decrease in the liquid limit is significant up to 5% of admixture there is an increase in dry density.

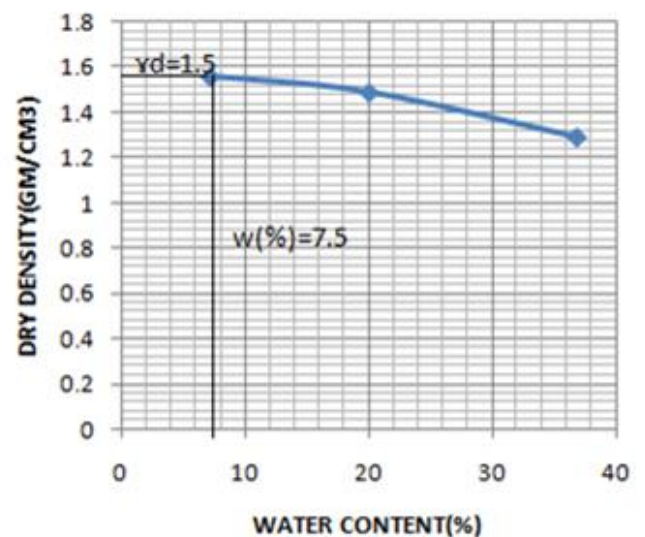


Chart -1: 15% Coconut shell ash.

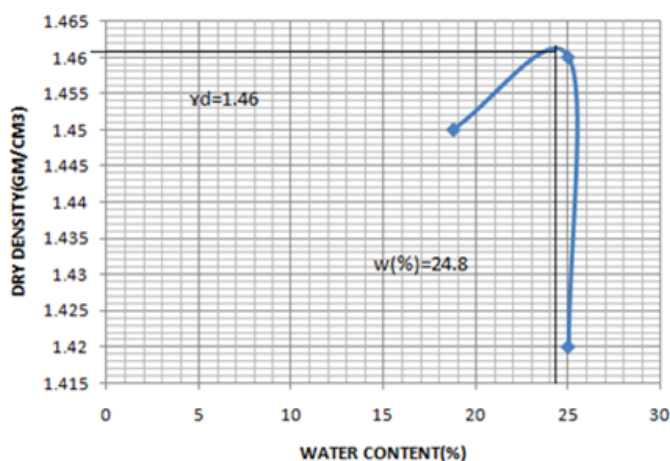


Chart -1: 5% Coconut shell ash.

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### 4. CONCLUSIONS

The plasticity index of each sample reduced with the addition of various percentages of CSA, indicating a reduction in swelling potential and hence an increase in strength properties. The samples gained higher unit weights with the addition of CSHA, the dry density of all samples increased respectively at 10% CSA values increased gradually with increased percentages of CSA. It was therefore concluded that coconut shell ash can effectively stabilize expansive soil.

