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Agriculture Waste - Wheat Husk Ash Used for Stabilization of Soil

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Abstract
Stabilization of soil done by using agriculture waste like- wheat husk ash for saving materials. Soil qualities are important factor to decide type of construction on the soil and design of foundation. Soil property like shear strength, moisture content, dry density these helps in identify for good soil. To determine the engineering properties of soil, different types of tests are use like- pycnometer, Unconfined compressive strength(UCS), California bearing ratio(CBR), Sieve analysis. In this research paper different types of test on soil with varying percentage 0%, 3%, 5%, 7% and 9% of Wheat husk ash(WHA) by replacing soil.

Keywords- CBR, UCS, WHA

1. Introduction

Soil is a essential material for construction of building, pavement and other work of construction. Soil contains engineering properties like UCS, dry density, OMC which is used for design of foundation and pavement construction. The property of soil are varies for different places. Earlier, In Europe stabilization of soil was done for road construction. For stabilization industrial waste like- Wheat husk ash, Rice husk ash, Fly ash is used to improve the properties of soil. In this study selected a additive is wheat husk ash for soil stabilization. Stabilization of soil is used to improve engineering properties of soil like- Bearing capacity of soil, Shear strength and reduce the permeability and compressibility of soil.

2. Objective

Wheat husk ash is agriculture waste which is accessible at farming field. To enhance the quality of soil by doing experiment with mixing of the wheat husk ash.

- Soil stabilization is investigating by utilizing agriculture waste material like wheat husk ash.
- To determine the engineering properties of natural soil by varying the percentage of wheat husk ash.

3. Materials

a) Natural soil

Table 1- Properties of soil

S. No.	Properties	Result
1	Specific gravity	2.62
2	Water content	5.13%
3	Swell Index	30%
4	Plastic limit	24%
5	Liquid limit	41%

b) Wheat Husk Ash

WHA is a cultured pozzolanic property. It is use for various purposes. It is the stable food that is given in large quantities to living and non living animals. The effect of WHA on the property of soil is considered. Wheat straw is taken from the fields and converted into ash.

Table 2- Chemical properties of WHA

S. No.	Compound	Value(%)
1	Silicon Oxide	42.53
2	Potassium Oxide	11.10
3	Magnesium Oxide	0.95
4	Iron Oxide	0.89
5	Sodium Oxide	0.15
6	Chromium Oxide	0.0006
7	Calcium Oxide	5.47
8	Manganese Oxide	0.03

4. Methodology

a) Sample preparation

The specimen for testing was established according to the requirements of the test. The soil sample was first sieved through the appropriate sieve for the respective tests. The required quantity of soil for testing was weighed. Similarly, wheat husk ash was prepared in the soil through the sieve required

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for sieving. Soil and Wheat husk ash were added to the dry state before testing.

b) Specific gravity by Pycnometer

The volume of the pycnometer is about 1 liter. Pycnometer method is to dry the pre-weighed soil sample in the pycnometer and fill in the remaining part. The pycnometer is filled with a pre-installed liquid. The density of samples can be determined by their known density of water. The weight of the pycnometer when it is filled with sample and liquid. This is a common method for determine the specific gravity of sample with help of pycnometer.

c) UCS Test

It is a type of unconsolidated undrained test generally used for soil having claying properties. It is used to determine the undrained shear strength of soil.

d) CBR Test

It is also known as penetration test and used to calculate the sub grade strengths. CBR apparatus consists of a mould of 150mm diameter with a base plate and a collar. Fill the soil sample in mould box. Each layer should be compacted by 56 blows in 5 layers.

5. Result & Discussion

Table 3- UCS Test Results

S. No.	Percentage of WHA(on x-axis)	UCS(g/cc) (on y-axis)
1	0	1.5
2	3	1.8
3	5	2.2
4	7	2.5
5	9	2.3

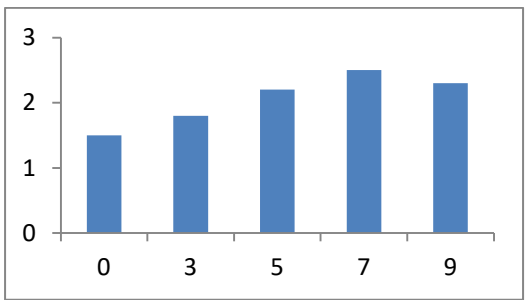

Fig 1:- UCS Test Result

Table 4- CBR Test Result

S. No.	Percentage of WHA(on x-axis)	CBR values (%) (on y-axis)
1	0	5.4
2	3	8.5
3	5	12.7
4	7	15.6
5	9	13.1

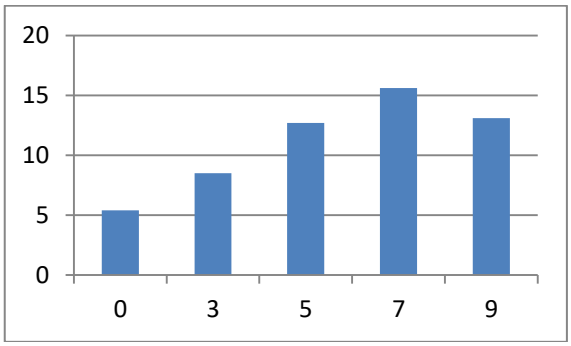

Fig 2:- CBR Test Result

5. Conclusion

a) In addition of different % of WHA, the addition of 7% WHA slowly after increasing the amount of water to a certain extent has given optimum results.

b) In addition of different % of WHA the CBR value was found to decrease after being raised to a limit and to be more effective at 7%.

c) UCS value up to a limit, increase with a increasing % of WHA thereafter it decreases and is more effective at 7%.

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