

STABILITY OF RED CLAY & LATERITE SOIL WITH SAWDUST AS AN AMMENDMENT

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ABSTRACT

This research was carried out with an intention to evaluate the effects of saw dust on the stability of red clay and Laterite soils from Bangalore, India. Tests were performed to determine geotechnical properties such as dry density, optimum moisture content and shear strength. These tests were conducted at non-stabilized states by **adding 2, 4, 6 and 8% of saw dust**. The results show that there is a very minute difference in **dry density and shear strength** when

saw dust is used in small amounts for red clay and Laterite soils.

The main object of this project is finding effective solutions for the problem of scarcity of fine aggregate/river sand in Karnataka. This article has a mission of providing some information about saw dust as an amendment for river sand. Saw dust is used so that geotechnical properties such as **dry density & shear strength** of the soil can be modified to prove as a viable material in future construction works.

1. INTRODUCTION



Laterite soil is rich in aluminum and iron, formed in wet and hot tropical areas. It is formed by the prolonged and rigorous weathering of the parent rock. Laterisation or tropical weathering is a long drawn-out process of chemical and mechanical weathering which results in a diversity in the nature, grade, thickness and ore mineralogy of the ensuing soils. Laterite soils are pregnant with aluminum and iron oxides, but are deficient in potash, phosphoric acid, lime and nitrogen. Laterite soil in Karnataka is mainly found in Bangalore, Bidar, Belgaum, Chickmagalur, Dharwad, Udupi, Kolar, Kodagu and Shimoga Districts. Red soil is formed due to weathering of igneous and metamorphic rocks. It is highly porous and fertility increases with depth. It is red in colour

due to the presence of iron. Red clayey soils occur on hilly to undulating landscape on granites, granitic gneisses and Dharwad schists, occupying areas as a long strip along the western Ghats in the transitional zone comprising western parts of Belgaum, Uttara Karnataka, Shimoga, Chitradurga, Udupi, Mangalore, Hassan and Kodagu districts and parts of Tumkur, Kolar and Bangalore districts. Due to indiscriminate construction activities and sand mining taking place in the metropolitan city of Bangalore, there is an acute shortage of river sand. Hence the use of saw dust in small percentages as an amendment in these soils would be useful for construction purposes.

2. MATERIALS AND METHODS

The materials used in this study are red clayey soil samples, Laterite soil samples, saw dust and water. Saw dust used in this experimentation consisted of a mixture of teak wood and a small amount of sandalwood. Saw dust is a loose particle or wood chipping obtained by sawing hard wood into standard useable sizes. Clean saw dust without a large amount of bark has proved to be satisfactory because of low organic content. Saw dust was obtained from a timber factory in Bangalore. The samples of red clayey soil and

Laterite soil were collected from Bangalore, Karnataka as shown in the map. The pits were excavated by diggers & shovels and the soil samples were collected in trays at an average depth of 1m to obtain true representative samples. Soil samples were air dried for about 24 hours before analysis commenced. Soil properties to be determined were dry density, optimum moisture content & shear strength. The compaction test involved the application of load on the soil samples which was divided into 5 layers in a modified

proctor mould (981.74cm³) and was subjected to 25 blows in each layer with 48.07N (4.9 kg) Rammer falling from a height of 0.45m. This was first done without adding any saw

dust and only thereafter saw dust of 2, 4, 6 and 8% was added to determine its influence on stability of the tested soil.

3. LOCATION

The study area lies within longitude 77°31'N and 77°40'N and between latitudes 12°54'E and 12°57'E which lies within Bangalore district, Karnataka, India.



4. RESULTS AND DISCUSSION

Results for red clayey soil are shown below:

RED CLAYEY SOIL		
Field density = 2.065 g/cc		
Saw dust (%)	Water content (%)	Dry density (g/cc)
0	2	1.9
	4	2.059
	6	2.165
	7	2.064
2	2	1.843
	4	1.903
	6	2.101
	8	2.007
4	2	1.832
	4	1.906
	6	1.951
	8	1.997
	10	1.967
6	2	1.797
	4	1.8875
	6	1.9698
	8	1.9231
8	2	1.7725
	4	1.83
	6	1.901
	8	1.912

RED CLAYEY SOIL	
Saw dust (%)	Shear strength (kg/cm ²)
0	0.133
2	0.133
4	0.1473
6	0.1263
8	0.1263

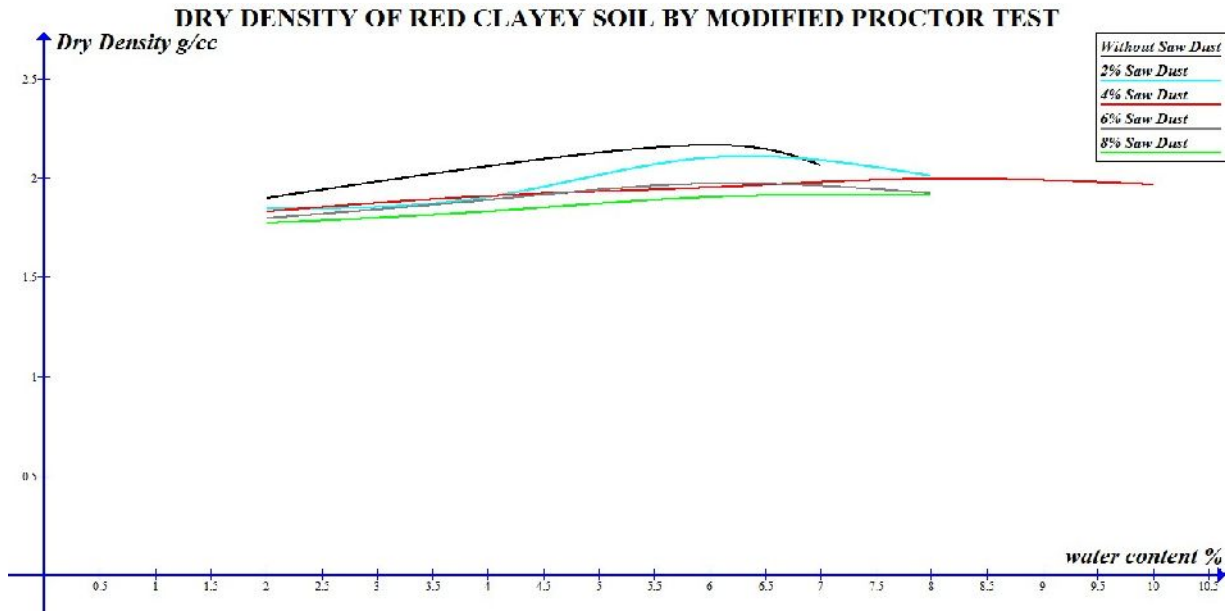


Fig. 1

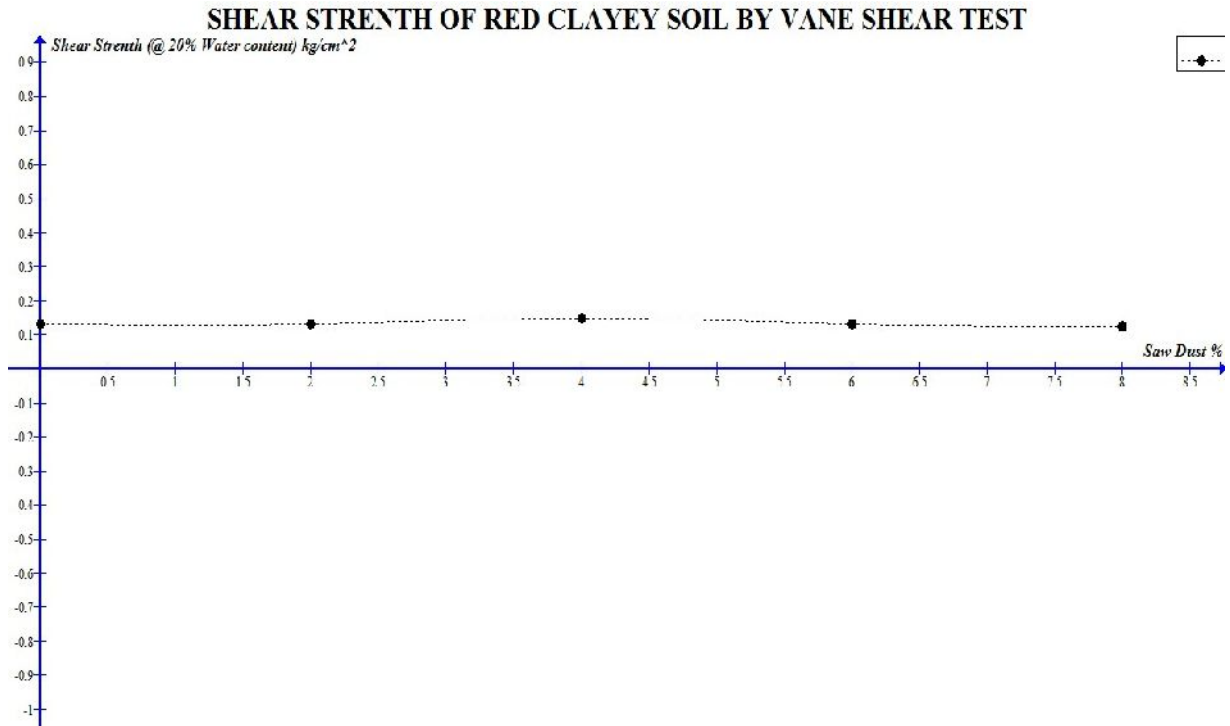


Fig. 2

Results for Laterite soil is shown below:

LATERITE SOIL			LATERITE SOIL		
Field density = 1.734 g/cc			Saw dust (%)	Normal stress (kg/cm ²)	Shear stress (kg/cm ²)
Saw dust (%)	Water content (%)	Dry density (g/cc)			
0	2	1.904	0	0.5	0.56
	4	1.966		1	1.09
	6	2.035		1.5	1.498
	8	2.098		2	1.8
	10	2.07		2.5	2.12
2	2	1.706	2	0.5	0.54
	4	1.782		1	1.059
	6	1.917		1.5	1.486
	8	1.998		2	1.792
	10	1.992		2.5	2.101
4	6	1.821	4	0.5	0.546
	8	1.857		1	1.087
	10	1.9		1.5	1.509
	12	1.901		2	1.8122
6	6	1.746	6	2.5	2.151
	8	1.786		0.5	0.57
	10	1.82		1	1.112
	12	1.861		1.5	1.534
	14	1.848		2	1.82
8	6	1.731	8	2.5	2.132
	8	1.768		0.5	0.586
	10	1.8		1	1.118
	12	1.857		1.5	1.5205
				2	1.812
				2.5	2.157

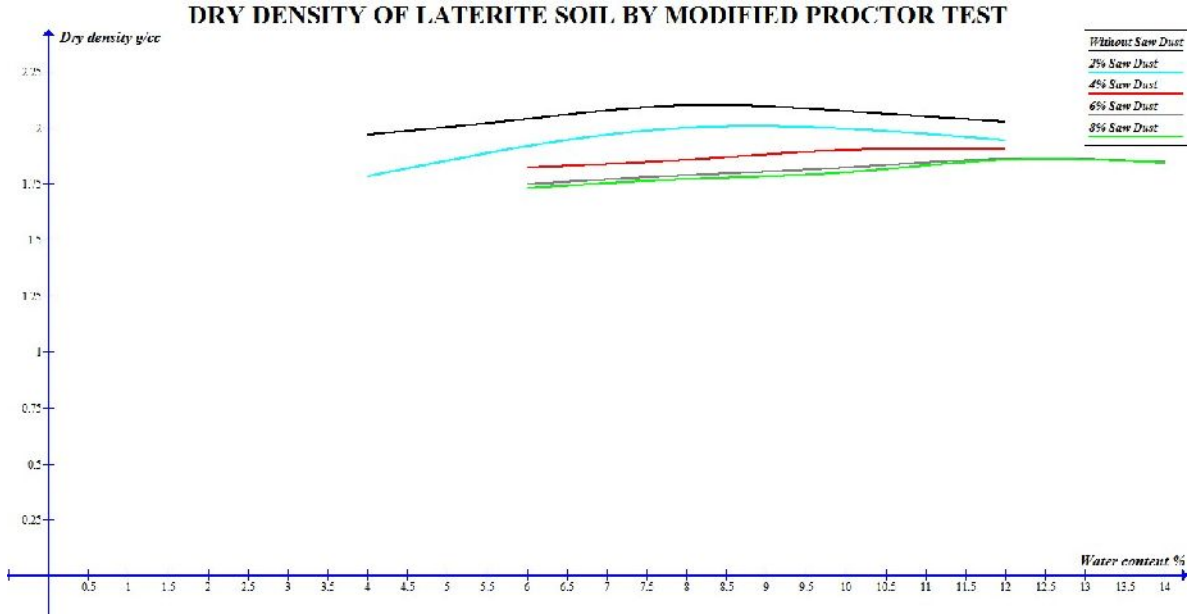


Fig. 3

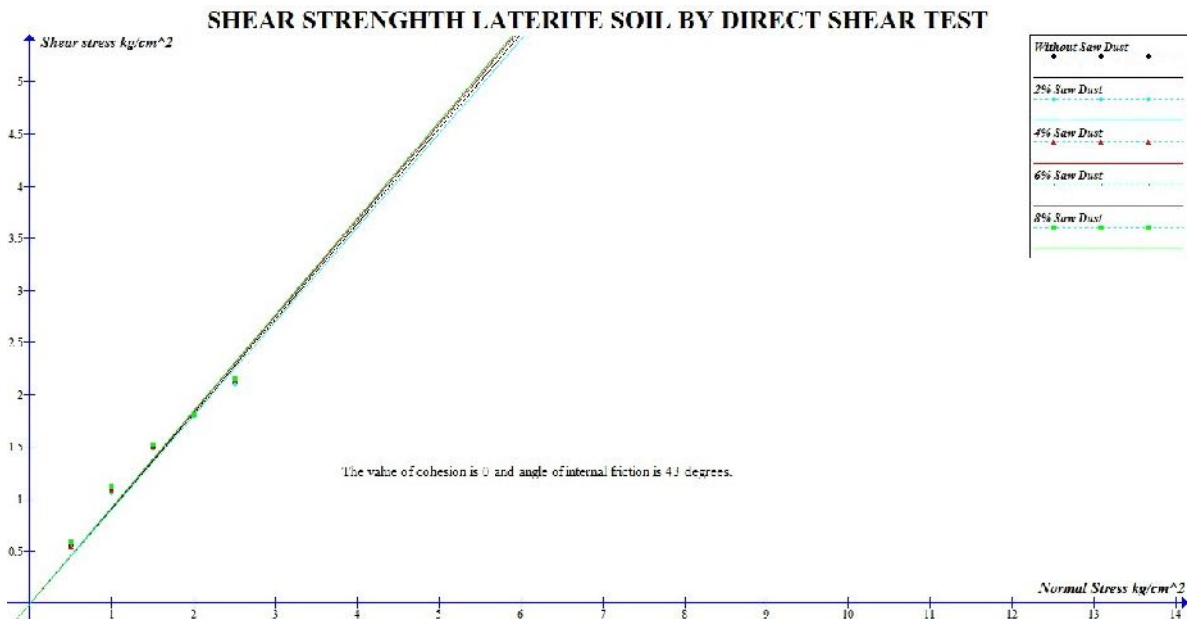


Fig. 4

5. CONCLUSION:

- Optimum moisture content and dry density are optimally improved by adding saw dust ash to red clay and Laterite soils.
- There is minimum variation in the shear strength of both red clay and Laterite soils when blended with saw dust ash.
- The study has revealed that small percentages of saw dust ash can be used as a cheap stabilizing agent in red clay and Laterite soils for engineering works.

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