

Effect of Wood Shaving Ash on Index Properties of Black Cotton Soil

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Abstract -The amount of waste generated from varied sources has increased in recent years due to increase in population, industrialization, social as well as economic activities. It has become the need of the hour to utilize this waste in the best manner yet to encourage the concept of reusing in waste management and thus reduce the cost of waste disposal. One such method of reusing is that by using it in the process of soil stabilization. Previous studies have shown how various materials can be used to stabilize as well as improve upon the properties of problematic soil. It is known black cotton soil is one of the most problematic soils that engineers have to deal with. This soil has a tendency to shrink and swell excessively due to which it becomes a highly plastic soil. This research work is mainly focused on assessing the effects of ash derived from powdered wood shaving on the plasticity index of black cotton soil. The research is done on soil derived from MIHAN area of Nagpur, Maharashtra using 15, 20 and 25 % of the above mentioned ash by mass of soil sample. In order to conclude our research, laboratory tests on the liquid limit and plastic limit of soil were performed to determine the plasticity index of the soil, first of the soil alone and then after addition of additives in accordance with IS 2720 of geotechnical engineering.

The result indicates that ash from wood shavings is suitable in improving the plasticity of soil having plasticity index 25

Key Words: Black cotton soil, Organic additives, wooden shavings ash, Plasticity index, plasticity of soil

1. INTRODUCTION:

Black cotton soils a highly fertile soil for agricultural purposes. They are characterized by high moisture retaining capacity, are extremely compact when wet and develops deep, wide cracks upon drying. Black cotton soil occurs mostly in the central and western parts and covers approximately 20% of the total area of India. It contains montmorillonite clay which renders it its expansive property. Due to its high shrink and swell property, black cotton soil has been a challenge to the highway engineers and structural engineers alike. Therefore, the sub grade and its undesirable and highly sensitive properties need to be modified using a suitable ground improvement or stabilizing technique.

A suitable stabilizing or ground improvement technique usually involves modification in undesirable characteristics of problem soil. This ultimately leads to improvement of engineering performance of subgrade. For airfield and road pavements, main purpose is to increase stability of soil while taking the approach wherein construction cost is minimized by making best use of locally available materials.

To overcome this challenge and to find a suitable stabilizing agent that is both easily found everywhere, cheaply available and is a byproduct that usually goes to waste, we finalized upon ash derived shavings of wood (bhusa).

The possibility to try and use this organic admixture to improve upon the plasticity of soil has been discussed in detail.

2. MATERIAL:

A) Material in use:

1. **Soil:** Expansive black cotton soil collected from the MIHAN area of Nagpur, Maharashtra was used. The basic index properties are as follows:

1. Liquid limit – 56%

2. Plastic limit – 31%
3. Plasticity Index – 25%

2. Organic admixture - ash of wood shavings:

Wood shavings in powder form were used. This powder has been later converted to ash by roasting. It was used in percentage by weight of soil at 15%, 20% and 25% by weight of soil.

B) Sample preparation: Collected soil sample is first air dried in direct sunlight. The organic matters, small aggregates, broken wooden material, pieces of glasses are removed carefully from soil sample. The prepared sample is then used for the liquid and plastic limit tests. The weight of soil sample taken for test is replaced by percentage of weight of ash of wood shavings. Four different blends are prepared for replacement of soil in varying proportion of 15%, 20% and 25%

3. TESTS CONDUCTED:

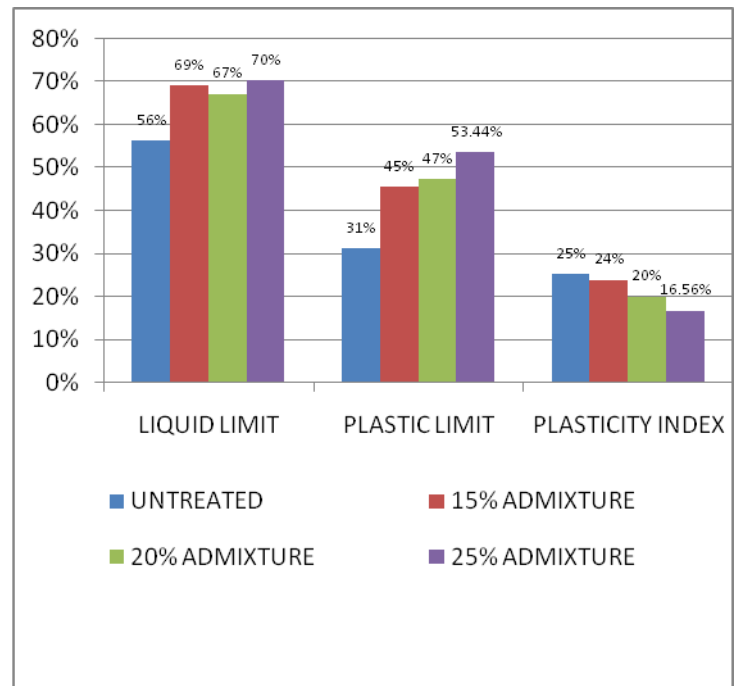
In order to determine any change in the plasticity of soil upon use of admixture, liquid and plastic limit of the collected soil sample was carried out in accordance with IS 2720 of Indian code.

1. **Liquid limit determination:**The liquid limit of treated and untreated expansive soil was determined using Casagrande’s liquid limit apparatus in accordance with the procedures laid down in IS: 2720 part 4 (1970).
2. **Plastic limit determination:** The plastic limit of treated and untreated expansive soil was determined in accordance with the procedure laid down in IS: 2720 part 4 (1970).

4. RESULTS AND DISCUSSIONS:

The results of liquid limit and plastic limit for untreated soil sample and treated soil sample with admixtures at varying percentages (15%, 20%, and 25%) are as follows:

DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
Untreated soil	56%	31%	25%
15% admixture	69%	45.3%	23.7%
20% admixture	67%	47.1%	19.82%
25% admixture	70%	53.44%	16.56%



5. CONCLUSIONS

The addition of ash of wood shavings has an effect on liquid and plastic limits of the soil and thus on plasticity of the soil. The results of the research thus indicate a reduction of plasticity index in each sample after addition of various percentages of ash of wood shavings. The plasticity index of untreated soil sample is 25 which reduces gradually and comes down to 16.56 at 25% of admixture added by weight of soil.

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