

# Study on Stabilization of Black Cotton Soil by using Copper Slag for Pavement Subgrade

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## ABSTRACT

- Soil stabilization improves various engineering properties e.g. bearing capacity, compressibility, strength, and various other properties of soil. In this study the impact of Copper slag to improve the strength of soil.
- Copper slag is a by-product of copper smelting and refining process. As refineries draw metal out of copper ore, they produce a large volume of non-metallic dust, soot, and rock.
- The effect of varying percentage of Copper slag on properties of Expansive Soil.
- To study the variation of Liquid Limit, Plastic Limit, Plasticity Index, Dry density, OMC, CBR (Soaked & Un-soaked) of soil.
- The strength has been compared on the basis of CBR for virgin soil and soil with Copper slag soaked conditions.
- The Unsoaked CBR value of the raw soil is 5.42 % and after mixing of Copper Slag in the soil, there is remarkable change in CBR value from 5.42 to 12.28%. when Copper Slag is increased from 0 to 16% is effective beyond also there is a decrease in CBR of soil from 12.28 to 10.47% when Copper Slag is increased from 16% to 24%.

**How to cite this paper:** Amar Jaiswal | Afzal Khan "Study on Stabilization of Black Cotton Soil by using Copper Slag for Pavement Subgrade" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-7 | Issue-1, February 2023, pp.6-9, URL: [www.ijtsrd.com/papers/ijtsrd52623.pdf](http://www.ijtsrd.com/papers/ijtsrd52623.pdf)



IJTSRD52623

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## INTRODUCTION

Soil is the basic construction material. It supports the substructure of any structure and in case of pavement structures; sub-grade soil is an essential component as it supports the sub- base/base. soils with significant plasticity may additionally shrink and swell drastically with modifications in moisture conditions. The repeated cycles of swelling or shrinkage of soil, in addition reason deteriorations and distresses at the structures if those are supported in these types of soil, This necessitates the development/stabilization of soil at a site as an imperative pastime, due to rising cost of the land and a big call for for infrastructure improvement in developing nations like India. Soil stabilization is a way added with the primary reason to adjust the geotechnical properties of the soils making them capable of assembly the necessities of the unique engineering projects. The most not unusual upgrades carried out through stabilization include higher soil gradation reduction of plasticity index or swelling potential and will increase electricity and durability.

Various stabilizers such as lime, cement and calcium chloride are traditionally used for the stabilization of expansive soils However, the over dependency on the utilization of such industrially manufactured soil stabilizing additives may significantly increase the cost of construction.

## COPPER SLAG

Copper slag is a by-product of copper smelting and refining process. As refineries draw metal out of copper ore, they produce a large volume of non-metallic dust, soot, and rock. Copper slag which is an industrial waste obtained from smelting and refining process of copper from industry.

## Objectives

The objectives of the research are outlined below:

- To study variation of Liquid Limit, Plastic Limit, Plasticity Index, Dry density, OMC, CBR of clayey soil with and without Copper Slag.

## Results

The results of Soaked CBR tests on Natural Soil treated with different percentage of Copper Slag and from the results it can be seen that with increase in percentage of Copper Slag, the Soaked CBR of soil goes on increasing from **2.53 to 7.22** when Red is increased from 0 to 16% is effective beyond also there is a decrease in CBR of soil from **7.22 to 5.42** when Copper Slag is increased from 16% to 24% as shown in the Table No.5.7 and Figure 5.36

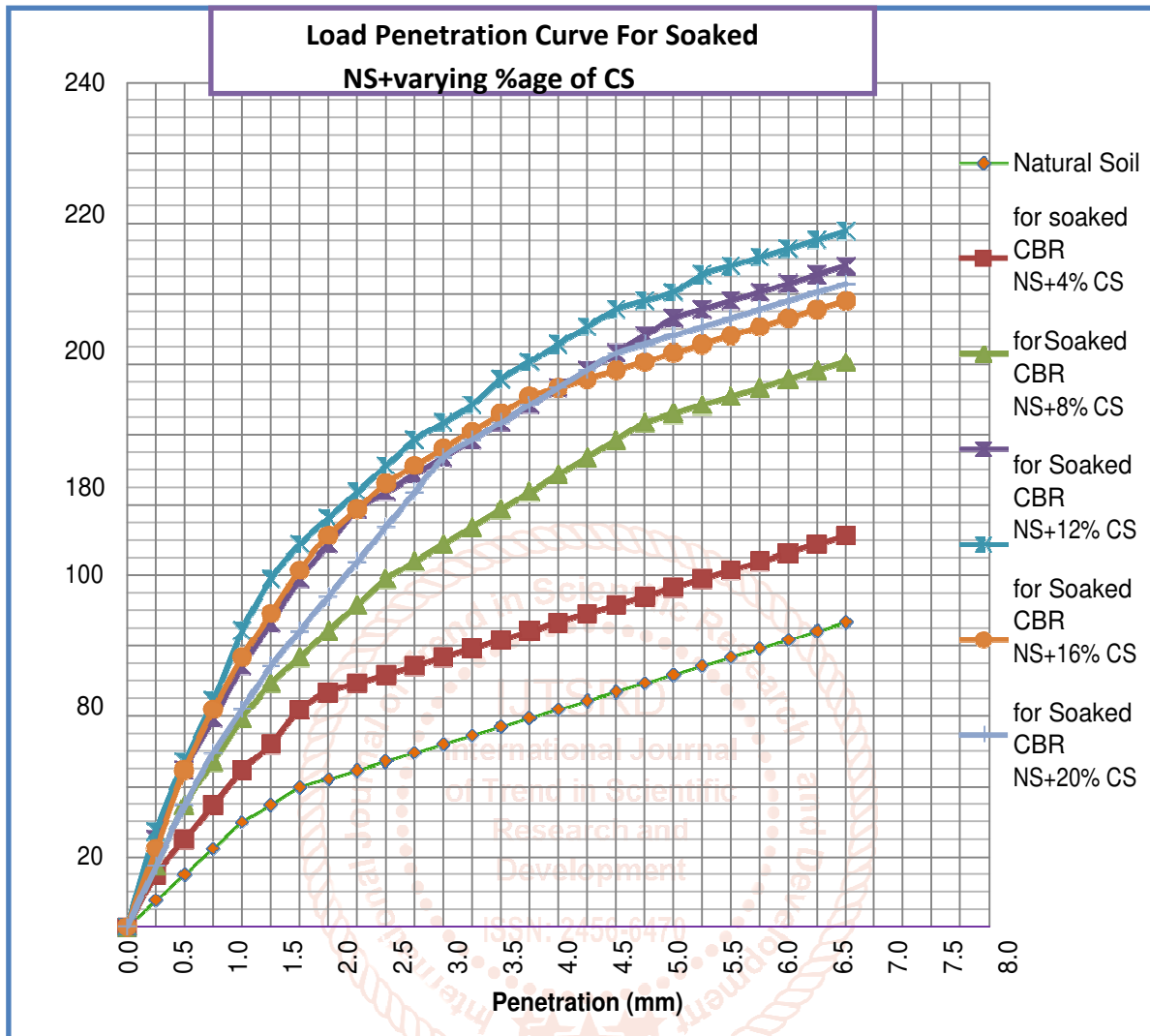


Figure 1 Combined Load – Penetration Curve for Soaked NS+ varying %age of Copper Slag

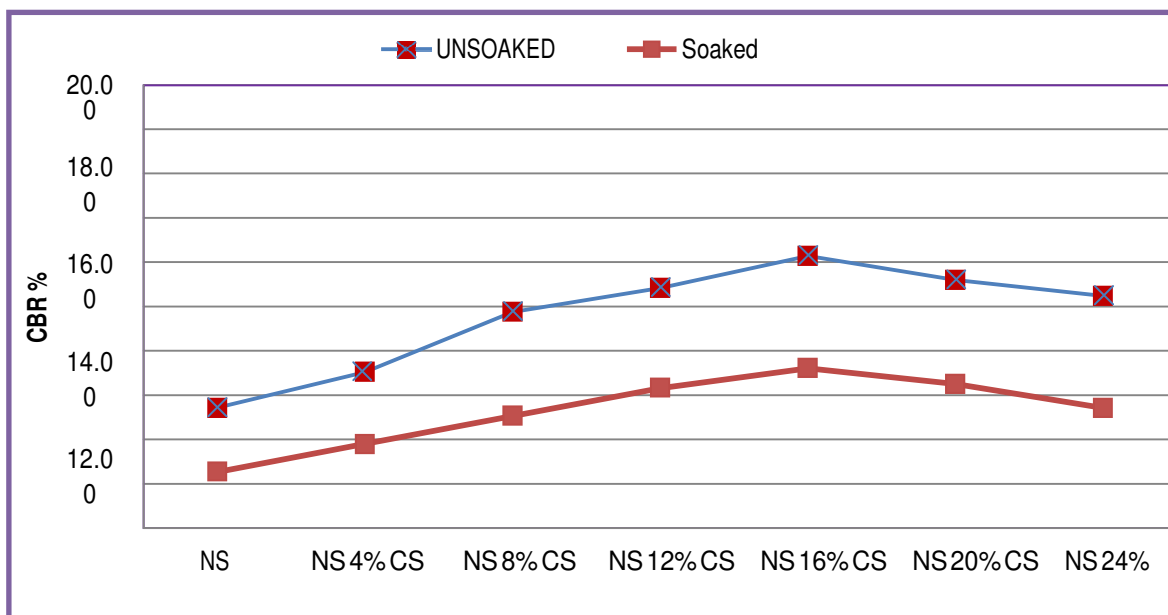


Figure 2 Variation in CBR Value of Natural Soil and Natural soil + varying %age of Copper Slag

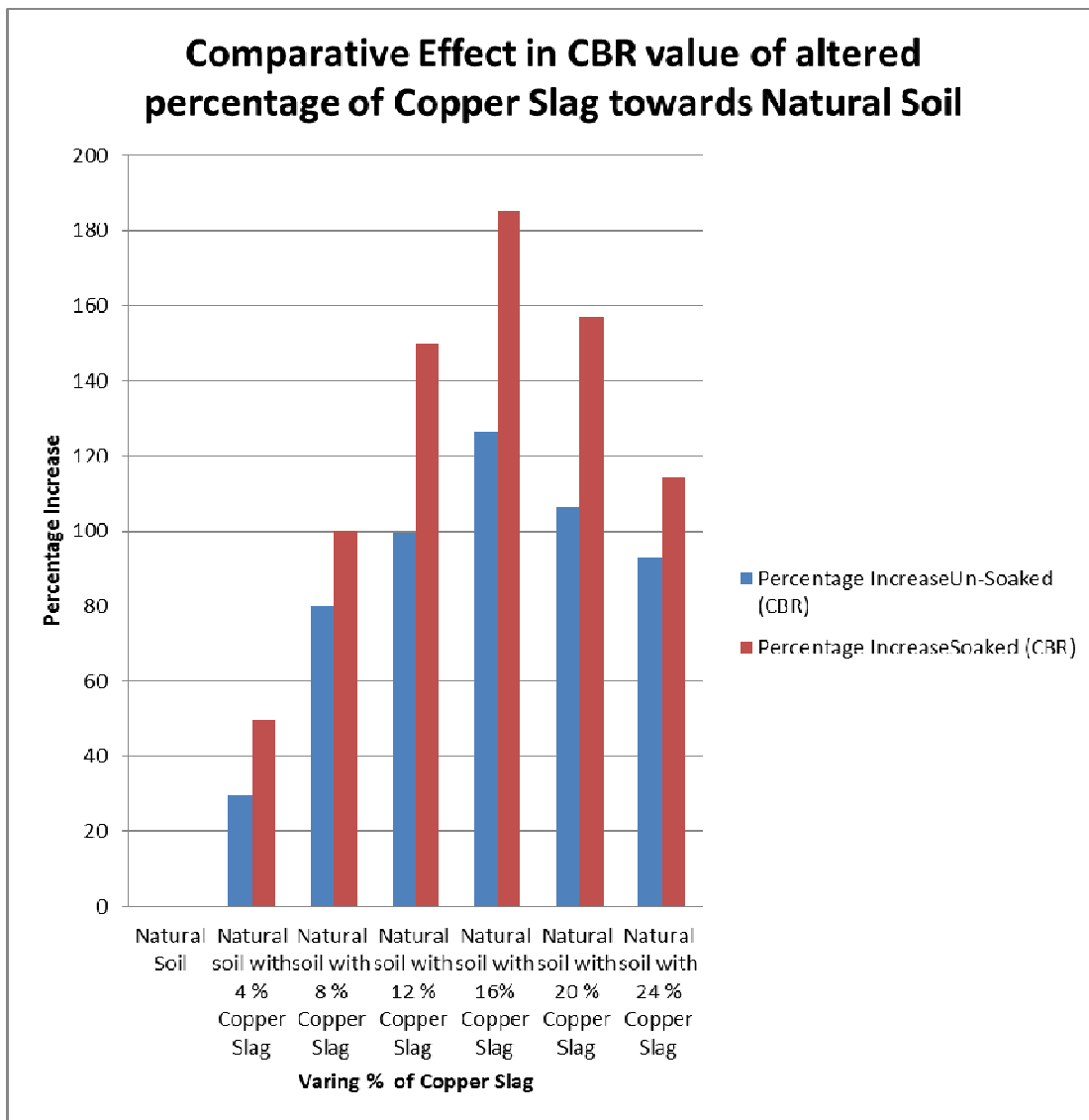


Figure .3 Variation of Increase in CBR value of altered % age of Copper Slag towards Natural Soil

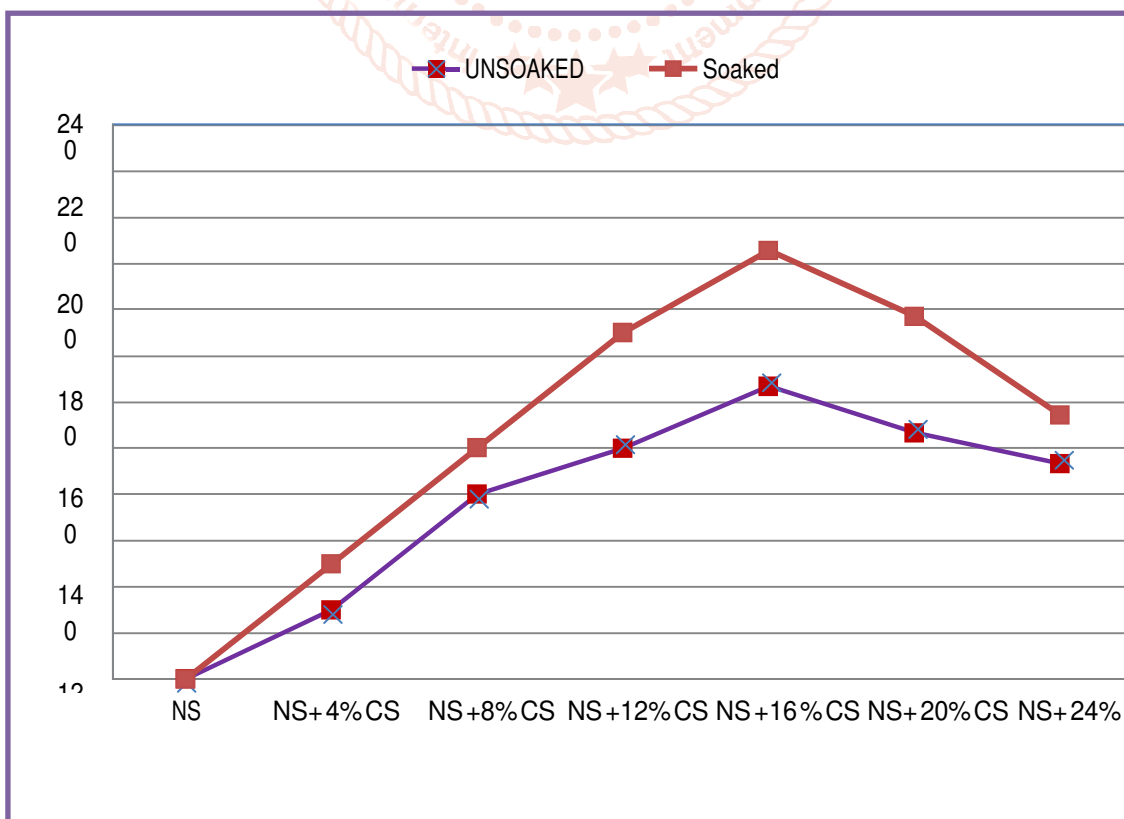


Figure 4 Effect of mixing % age of Copper Slag on CBR value

**Conclusion-**

Based on the experimental investigation the following conclusion is given within the limitation of the test result.

In above study, The results of percentage increment in Unsoaked CBR goes on increasing from 29.89 to 126.57% with respect to Natural Soil when Copper Slag is increased from 0 to 16% and is decreases from 126.57 to 93.17% when Copper Slag is increased from 16% to 24%. However in Soaked CBR it increases from 49.80 to 185.38%.

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