"SOIL STABILIZATION USING COPPER AS WASTE ELECTRIC WIRE"

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Abstract: *Soil stabilization is required to increase the strength and reduce settlement of poor soil by means of control compaction, proportioning and adding suitable stabilizer. To stabilize poor soil there is always a need of material which is Economical in cost and environmental friendly which can impart desired strength with effectiveness in construction.*

This study proposes partial solution to this problem as copper (waste) is used as a stabilizer for The soil samples of having copper (waste) is strengthened by using different percentage 5%, 7%, 9%. Various tests were conducted to analyze the Engineering properties like optimum moisture content(OMC), maximum dry density(MDD), The Cohesion(c), angle of friction(ϕ) and CBR values of stabilized soil determined respectively.

***Key Words*:** Soil Stabilization, Waste Electric Wire, Copper, Cost analysis, CBR and angle of Friction.

1. INTRODUCTION

1.1 Soil and Soil Engineering

The term 'soil' is deposits of mineral and/or organic particles or fragments covering large portion of the earth's crust. It includes widely different materials like boulders, sand, gravels, clays and silts, and the range in the particle sizes in a soil may extend from grains only a fraction of a micron (10-4 cm) in diameter up to large size boulders**.**

1.2 Waste Electric wires

The electric wires which are generally used in electrification are used in this research work. These wires are coated with polypropylene fibers. Polypropylene fiber is one of the most common synthetic materials used for reinforcing soil due to its non-toxicity, corrosion resistance and high tensile strength

Electrical wire is basically a semi-conducting metal wrapped in a plastic insulation. Depending upon the wire being reused the conduit metal may likewise be aluminum or silver This material can be tedious to separate and many companies that scrap this material don't have time to recycle it [11].

E-waste is one among of the fastest growing was test reams these days and is growing almost thrice times the rate of municipal waste. Globalization results in both pressure and drivers for Indian citizens to improve their environmental performance [1].

2. Material Used

Soil: Which is locally available as mentioned above

Waste Electric wires: Reinforcement of soil was done by the electric wires which are waste material produced after the electrification of building or any other structure. Some of the properties were:

Table-1: Properties of E-wires

Aspect ratio(length/diameter)	2:1
Average diameter	1.66mm
Average length	3.32mm

Specific Gravity	2.51
Unit weight	1200Kg/m^3

3. RESEARCH METHODOLOGY

3.1 Preparation of material

Natural Soil is collected from site and brought to soil lab and spread for air drying. After this, screening of soil is done to sort out the organic matter, coarser particles, grass twigs etc. After this key properties of soil are found and after that mixing of E-wires are done. For mixing the E-wires to the soil, steps to be follow:

All the soil samples are compacted at their relevant maximum dry density (MDD) and optimum moisture content (OMC), corresponding to the standard proctor compaction tests.

The different values adopted in the present study for the percentage of fiber reinforcement are 0%, 5%, 7%, and 9%.

In the preparation of samples, making sure that all the fibers were mixed thoroughly, so that a practically homogenous mixture is obtained, and then the necessary water was added.

3.2 Various Test involved in Research Work

1.4.1 Water content by Oven Dried method [IS 2720 part II – 1973]

1.4.2 Wet Sieve Analysis [IS 2720 part IV – 1985]

1.4.3 Specific Gravity by Pycnometer [IS 2720 part III- 1980]

1.4.4 Liquid Limit by A. Cassagrande apparatus [IS 2720 part V – 1985]

1.4.5 Plastic Limit Test [IS 2720 part V – 1985]

1.4.6 Compaction test by Proctor method [IS 2720 part VIII - 1980]

1.4.7 California Bearing Ratio test [IS 2720 (Part 16) - 1985]

1.4.8 Triaxial shear test[IS 2720 (Part XI) - 1993]

4. Results

4.1 Comparison of Results of treated and untreated Soil

4.1.1 Comparison of Liquid limit with respect to Soil

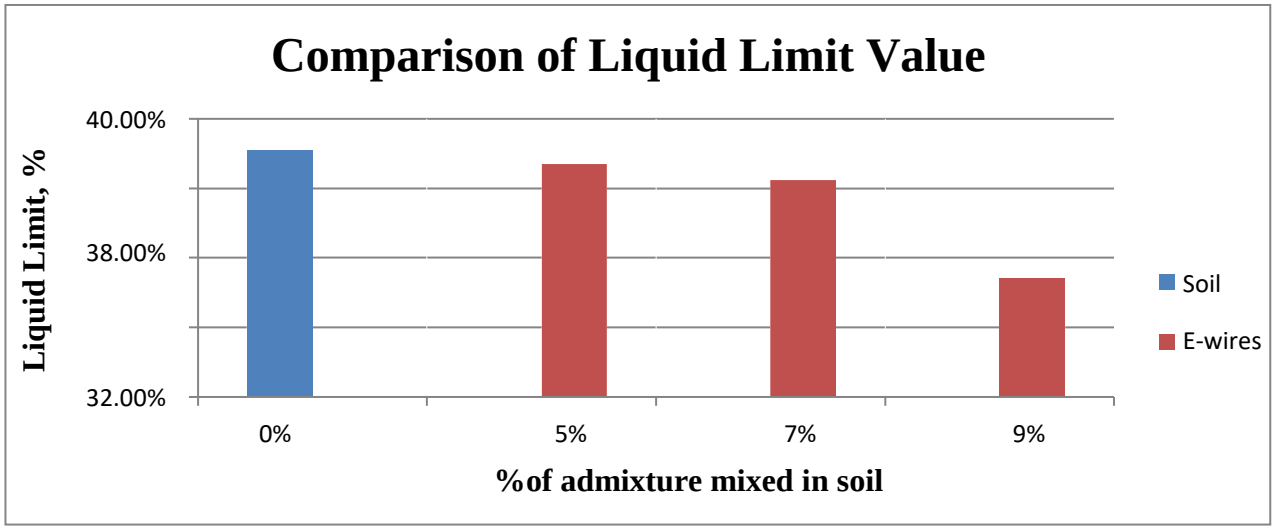

Fig-4.1: Comparison of Liquid Limit value

4.1.2 Comparison of OMC of treated and untreated Soil

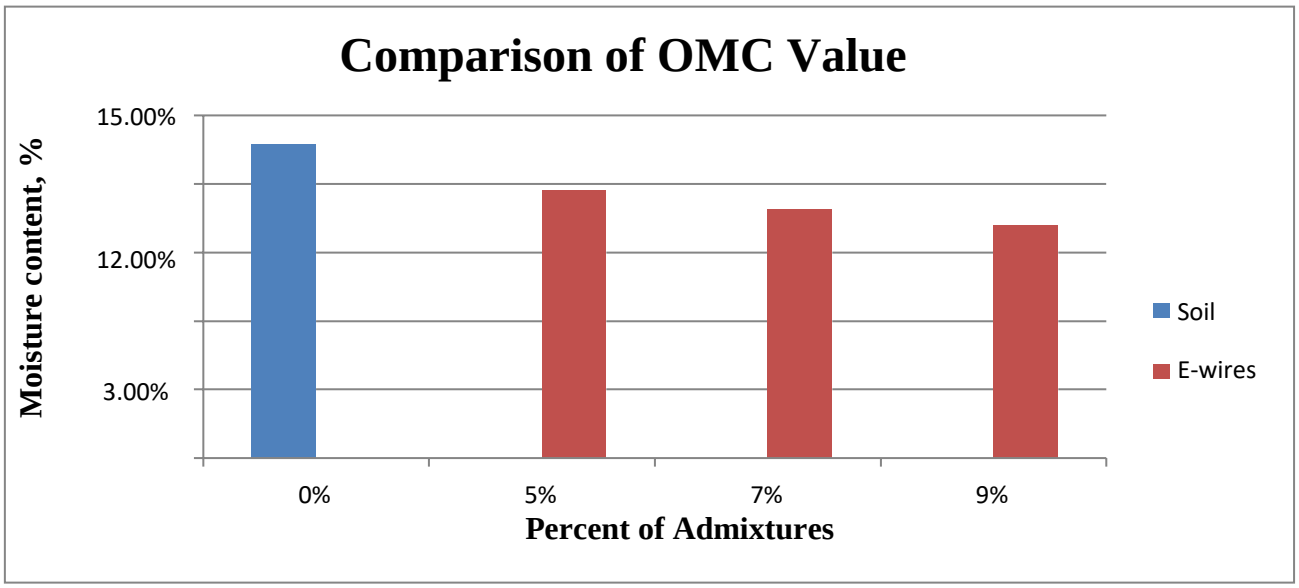

Fig-4.2: Comparison of OMC Value

4.1.3 Comparison of MDD of treated and untreated Soil

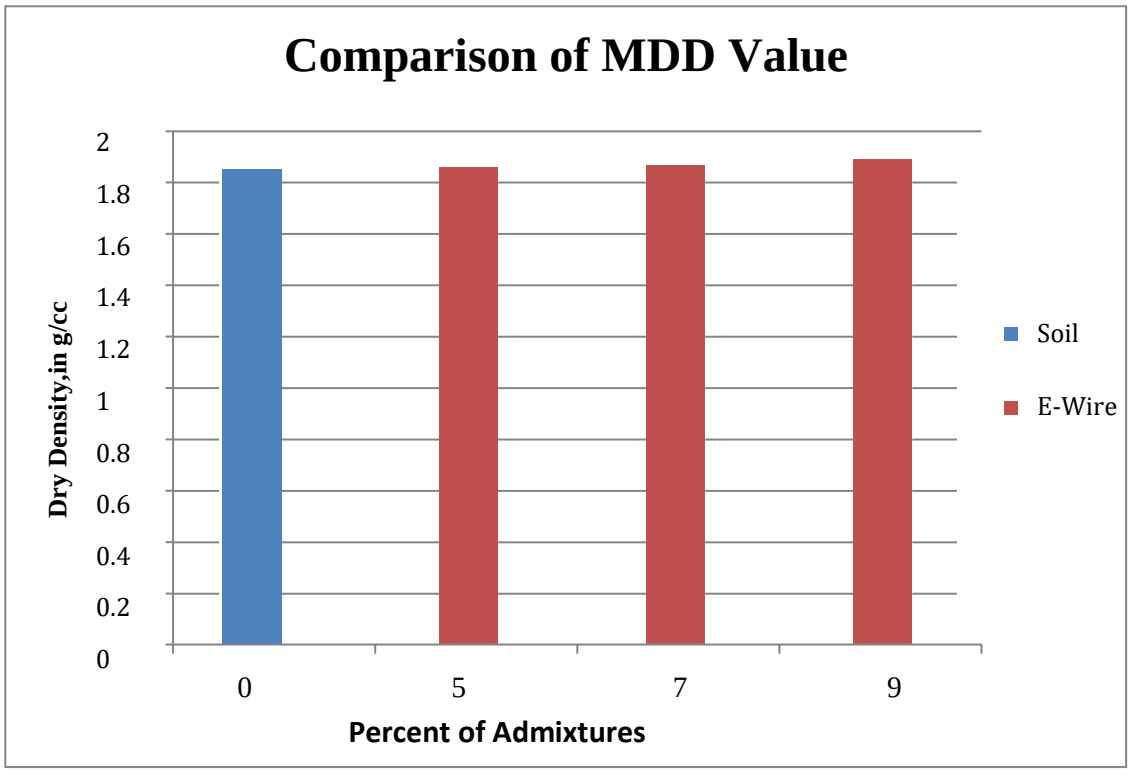

Fig-4.3: Comparison of MDD Value

4.1.4 Comparison of CBR values

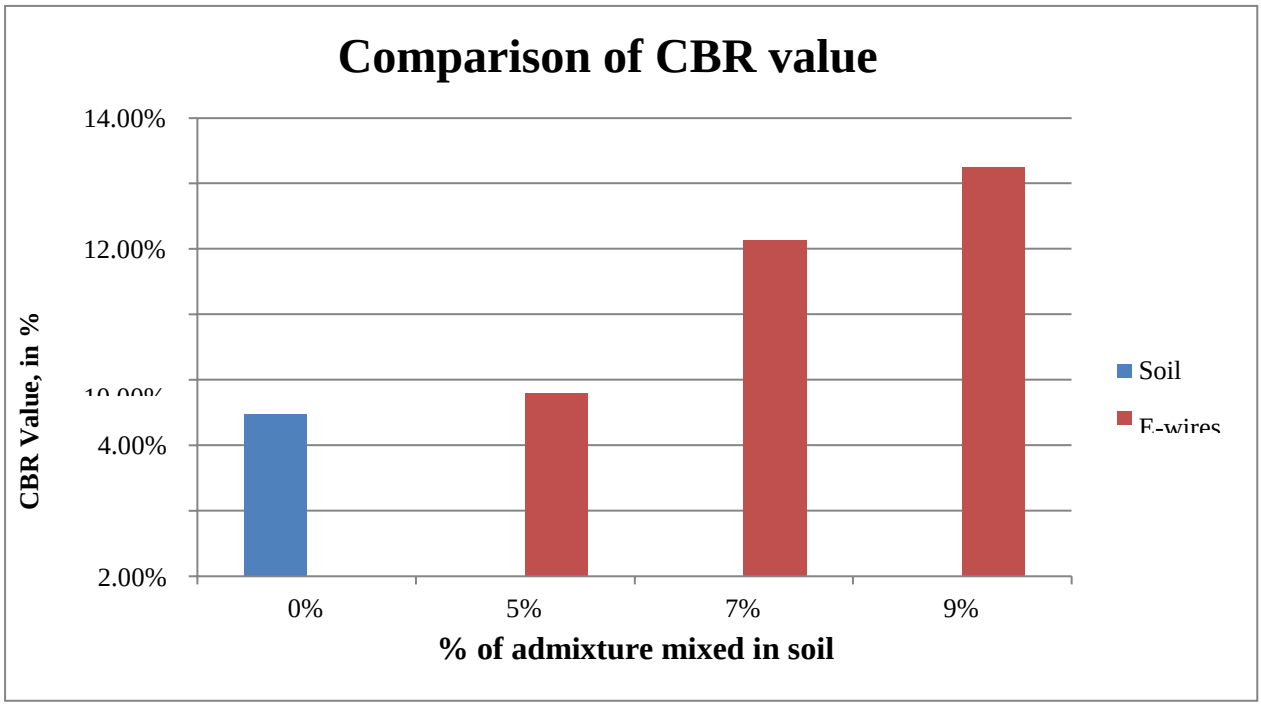

Fig-4.4: Comparison of CBR Value

4.1.5 Comparison of Angle of Friction of Soil

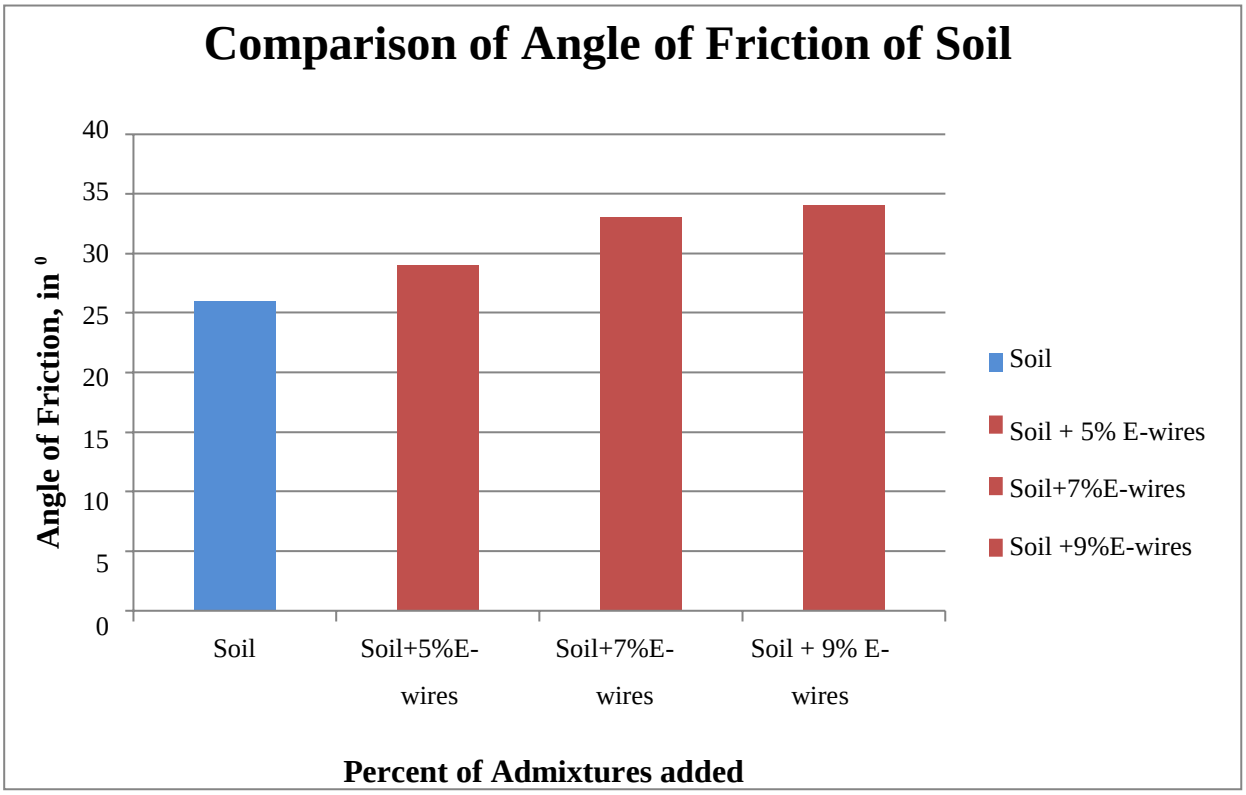

Fig-4.5: Comparison of Angle of Friction of Soil

6. CONCLUSIONS

- It has been found that there is a maximum improvement in strength properties for the combination of E-wires with Soil at 9%.
- The liquid limit of natural soil when added with E-wires is decreased.
- As the percent of electric wires increases, OMC of natural soil decreases and MDD increases.
- Some factors such as curing and compaction parameters have considerable effect on strength measured by the CBR and Triaxial test of the treated soil with time and have to be taken in account during foundation works.
- The cohesion value is decreased from 0.54 to 0.49 Kg/cm^2 and angle of friction increases from 26^0 to 34^0. The increment of these values shows great improvement in soil characteristics.
- There are many benefits of using E-wires in stabilization such as applicable in any climatic condition, waste reduction, environment friendly (carbon emission is negligible) and also cost effective.

7. FUTURE SCOPE OF THE PRESENT WORK

Following works can be recommended for future study on this research work;

- The present study is limited up to three percent only due to limited time, further the percent dose scan be increased

or decreases.

- The E-wires can also be used with other traditional stabilizer such as lime, cement for more improvement of soil.
- The Aspect ratio of E-wires can also change and their effect can be investigated.
- Comparison of electric wire waste with other waste material which can be used as a stabilizer.
- With day by day increase in cost of cement and the amount of pollution caused by cement factories it is mandatory to look for other material to stabilized soil. Cooper waste is having good properties that make it an attractive alternative in future.

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