

Comparative Analysis of Soil Stabilization by using Coir Fiber and Waste Plastic Fiber

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Abstract - Soil stabilization is the method by which we can improve the physical properties of the soil. In the construction work, many problems are facing in the engineering properties of soil. The best way to improve it by stabilization, many properties of soil can be improved by stabilization are bearing capacity, compressibility, strength, and many other properties. In the past research, we study that by using coir Fiber and plastic waste the engineering properties of soil can be improved. Some soil like expensive soil or black cotton soil has swelling and shrinkage problems.

Key words: Coir Fiber, Plastic Waste, Soil Stabilization

1. INTRODUCTION

- Some type of soils is not good for construction work, like expensive soil (black cotton soil) it shows the swelling and shrinkage properties.
- Different methods have been developed for the stabilization of weak or unstable soil and these methods include mechanical, cement, lime, bituminous, chemical, thermal, electrical stabilization. Now, researchers find a better way for soil stabilization using waste materials. Plastics and fiber are the leading waste materials that are found to be suitable for soil stabilization.
- Providing filtration and drainage, aids in improving subsurface drainage and allow the rapid dissipation of excess subgrade pore pressures caused by traffic load.
- The plastic waste and coir fiber minimize the possibility of erosion in the drainage layer and resist clogging of the filter over the design life of the pavement and the coir fiber is an important commercial product obtained from the husk of the coconut.

1.1 MATERIALS

1.2 PLASTIC WASTE: Plastic is a strong, durable, waterproof, lightweight, easy to mold, and recyclable material. Plastic waste generation has progressively increased over the past 30 years. By recycling techniques thermal pyrolysis, catalytic pyrolysis, gasification of waste plastics is used to include and filling, incineration, chemical or mechanical recycling, and conversion to fuel.

1.3 COIR FIBER: Coir fiber is a natural fiber it is extracted from the outer husk of the coconut. The global annual production of coir fiber is about 350,000 metric tons. The world's top two producers India and Sri Lanka, about 90% of global coir fiber production. In the southern states of India and in Sri Lanka, where the best quality fibers are produced, the average yield is 80 to 90 grams per husk. Husks are composed of 70% of pith and 30% of fiber on a dry-weight basis.

2. LITERATURE REVIEW

S.K Singh, S. M. Arif (2014) In this study there is an increase in the UCS value when 20% of ash is mix with soil and the amount is 1.81kg. It is concluded that the inclusion of 0.25% coconut coir fiber in 80% soil and 20% coal ash by weight is the optimum percentage of materials in consideration of soaked C.B.R. value and U.C.S

Akinwumi, (2019) In this research work was to investigate the effects of stabilizing soil with waste plastic on the suitability of using the stabilized soil to produce compressed earth bricks (CEB). Two categories of waste plastic were used, one is particle sizes less than 6.3 mm and the other is particle sizes greater than 9.6 mm. The Effects of the waste plastic on the properties of strength and durability of the CEB were investigated. To improve the compressive strength and durability of CEB containing waste plastic.

Ishfaq Ahmad, Er Abhishek Bawa. (2018) The compaction tests performed provided results that showed a decrease in Optimum Moisture Content (OMC) from 13.65% to 12.60 % and an increase in Maximum Dry Density (MDD) values from 1.85 g/cc to 1.90 g/cc with the addition of Coconut coir Fiber content from 0% to 25%.

Shukla Devdatt, et al. (2015) There is an addition of coir fiber inexpensive soil and the compaction properties were changed. The optimum moisture content decreases and the dry density is increases. By the addition of 1% coir Fiber, the CBR value is increased from 3.9 % to 8.6%.it will be seen that the addition of industrial waste like Coconut coir Fiber has been improving the engineering properties of expensive soil and making it suitable in many geotechnical applications.

R.R Singh et al. (2014) Coir fiber is a waste material that can be utilized in a sub-base for flexible and rigid pavements. The Maximum improvement in unconfined compressive strength and California bearing ratio values are observed

when 1% of coir is mixed with the soil. The optimum moisture content increase to increase the percentage of coir fiber. It is concluded that the proportion of 1% coir fiber in the soil is the optimum percentage of materials having a maximum CBR value.

N. Venkat Hussian Reddy et al. (2017) The use of plastic as a soil stabilizing agent for improving the properties of expandable soils with the proper proportion of plastic strips must be there, which helps in increasing the CBR of the soil. It can be concluded that CBR percentage of black cotton soil goes on increasing up to 4% plastic content in the soil and there on it decreases with increase in plastic content. Hence, we can say that 4% plastic and 5 % lime content is the optimum content of stabilizers used in the stabilization of the BC soil.

Leema Peter et al. (2014) In this research the CBR value was increased by 192% and 335 % for 2% coir pith and 0.6 % of short coir fiber addition, and the combined treatment increased the CBR by 4.6 times. The combined treatment increased from 7.92MPa to 9.66 MPa. The effective use of coir waste can increase the rural economy and also good for construction work.

Rebecca Belay Kassa et al. (2020) There is an improvement in unconfined compressive strength. By increase in size and content has brought a reduction in UCS because the increase in size causes uncompacted weak shear planes. The swelling of the soil is also decreasing. The swelling reduction is different for the different sizes. It shows that the dominant factor that contributes to a reduction in swelling is the percent by weight of plastic content. An increase in plastic size for the same percentage has increased in soaked CBR value but an increase in plastic content for the same plastic size increases the soaked CBR then decreases.

3. CONCLUSIONS

By study the past research on soil stabilization using coir fiber and plastic waste the engineering properties of the soil will change and some are:

1. By the addition of plastic waste and coir fiber in the soil the strength, bearing capacity, compressibility will be increase.
2. It can be concluded that CBR percentage goes on increasing up to 4% plastic waste adding in the soil and the CBR value decreases with an increase in the percentage of waste plastic.
3. If we can add some percentage of plastic waste to soil i.e., 2%, 4%, 6%, 8%, and the CBR value has been increasing up to 4% plastic waste after that it shows a decrease in the CBR value.

4. Coir fiber is a biodegradable waste material that improves the engineering properties of black cotton soil or expensive soil. The effective use of coir waste can uplift the rural economy and leads to beneficial effects in engineering construction.

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BIOGRAPHIES



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