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AN EXPERIMENTAL STUDY OF STRENGTHENING CLAY SOIL BY USING POLYPROPYLENE FIBRE

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ABSTRACT

Soil stabilization are often explained because the alteration of the soil properties by chemical or physical means that so as to reinforce the engineering quality of the soil. the most objectives of the soil stabilization is to extend the bearing capability of the soil, its resistance to weathering method and soil porousness. the prevailing soil at a selected location might not be appropriate for the development thanks to poor bearing capability and better sponginess. notably Clay soil exhibits usually undesirable engineering properties. The expansive soil that spreads over in depth space in Coimbatore posses serious issues for buildings and roads. It exhibits a bent of swelling and enlargement on returning in reality with water and shrinks on removal of water that lead to structural harm to engineering structures. the target of this study is to boost the strength of the Clay soil by creating Soil Polyprolyene fiber mixture. The specimens area unit to be ready to analyze the properties of soil by adding 6 Jute , 8%, 100% 12-tone system & Bastille Day of Polyprolyene fiber. From these specimens the Optimum fiber length and ratio for the Polyprolyene fiber is known enhance its strength characteristics.

KEYWORDS: Clay, PP Fibre, Bearing Capacity, & Structural damage.

I. INTRODUCTION

Practice of urbanization and industry is thus rampant recently. So there's bountiful offer of soil, the most affordable construction material might exhibit some uncovered properties for supposed construction purpose. like construction on soft soil like clay seems to be tough and it causes substantial distress to the superimposed structure because it possesses low shear strength and high squeeze ability. The ‘shrink-swell' behavior of clayey soil will endanger the development work inflicting excessive settlement at the location. once more soil are often telescopic or liquifiable that square measure tough to handle. In search of the appropriate web site, interference with natural stability isn't counseled. Destruction of forest and farming land, natural slope leads to imbalance in life, natural calamities like explosive flood, landslides etc. this can be definitely threatening to man and their survival. This drawback wants serious attention and various answer is to use adopted. rather than looking a replacement land, one will opt for the betterment for the soil properties by completely different means that like compaction, use of piles, replacement of soil, soil reinforcement, etc. It may be done by incorporating completely different materials like ash, lime, rice husk ash, industrial wastes etc., having least or no production price. Hence, problematic soil like clayey soil should be adequately treated before the erection of structure. big selection of soil modification technique is obtainable. choice of applicable technique ought to be supported the sort of soil and its characteristics, style of the development, time on the market, associated price. it's been ascertained that industrial by-products will cause forceful modification within the soil properties in terms of strength characteristics, density, acidity etc., arid conjointly serves agricultural advantages by increasing crop yield. a lot of over utilization of those merchandise may be a higher answer to disposal than heaving them au courant land.

Polypropylene could be a 100% fiber that is remodeled from eighty fifth gas. The compound of plastic is gas. plastic could be a by product of fossil fuel. Plastic fibers are composed of crystalline and non-crystalline regions. The spherulites developed from a nucleus will zero in size from fractions of a micrometer to centimeters in diameter. The axis of the crystal building block is aligned radially and therefore the chain axis homogeneously distributed in planes perpendicular to the current radial direction. every crystal is encircled by

non-crystalline material. Fiber spinning and drawing could cause the orientation of each crystalline and amorphous regions. If the extension is a smaller amount than zero.5%, the spherulite deformation is elastic and no disruption of the structure happens, otherwise spherulites ar extremely familiarised within the direction of the force and eventually ar reborn to small fibrils. These extremely aeolotropic microfibrillar structures result in aeolotropic fiber properties.

II. METHODOLOGY

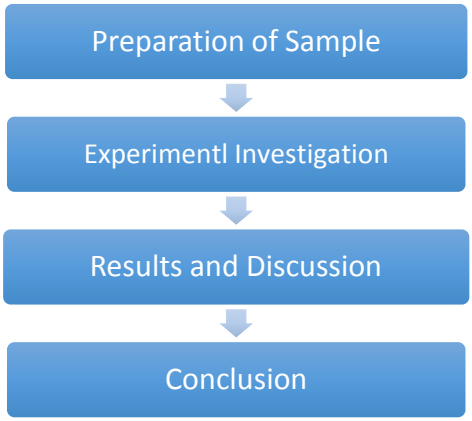

Fig-1: Methodology

III. EXPREMENTAL INVESTIGATION AND DISCUSSION

Through Material Investigation and Experimental Investigation, the various properties of the Clay soil were checked and the results of these tests were analyzed with existing standard results. The following are the various tests results obtained.

COMPARISON OF STANDARD PROCTOR COMPACTION TEST RESULTS OF CLAY SOIL

Table-1: Comparison of SPCT Test Results of Clay soil with PP Fiber

S No.	Type of Soil	Optimum Moisture Content (%)	Maximum Dry Density (g/cc)
1	Conventional Clay soil	20%	1.654 g/cc
2	Clay soil with 6% PP Fiber	20%	1.563 g/cc
3	Clay Soil with 8% PP Fiber	24%	1.612 g/cc
4	Clay Soil with 10% PP Fiber	24%	1.354 g/cc
5	Clay Soil with l2% PP Fiber	24%	1.310 g/cc

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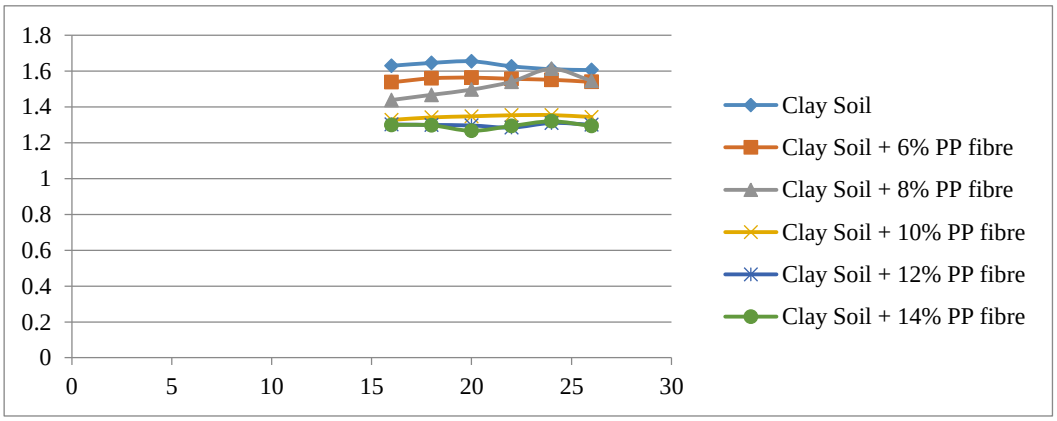

Fig-2: Comparison Graph - SPCT for Infiltrated Clay soil

COMPARISON OF UNCONFINED COMPRESSIVE STRENGTH TEST RESULTS OF CLAY SOIL:

Table-2: Comparison of UCC Test Results of Clay soil with PP Fiber

S No.	Type of Soil	Optimum Moisture Content (%)	Maximum Dry Density (g/cc)
1	Conventional Clay soil	20%	0.770 Kg/cm^2
2	Clay soil with 6% PP Fiber	20%	1.211 Kg/cm^2
3	Clay Soil with 8% PP Fiber	24%	1.904 Kg/cm^2
4	Clay Soil with 10% PP Fiber	24%	1.466 Kg/cm^2
5	Clay Soil with l2% PP Fiber	24%	3.516 Kg/cm^2

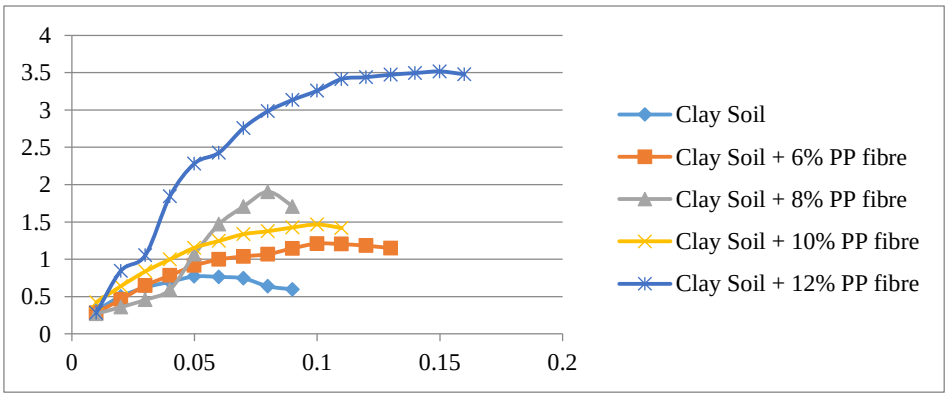

Fig-3: Comparison Graph - UCC for Infiltrated Clay soil

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COMPARISON OF CALIFORNIA BEARING RATIO TEST RESULTS OF CLAY SOIL AFTER INFILTRATION WITH POLYPROPYLENE FIBER:

Table-3: Comparison of CBR Test Results of Clay soil after Infiltration with Polypropylene fiber

S No.	Type of Soil	CBR Value for 2.5 mm Penetration	CBR Value for 5 mm Penetration
1	Conventional Clay	1.79%	2.09%
2	Clay with l2% PP fiber	5.85%	6.29%

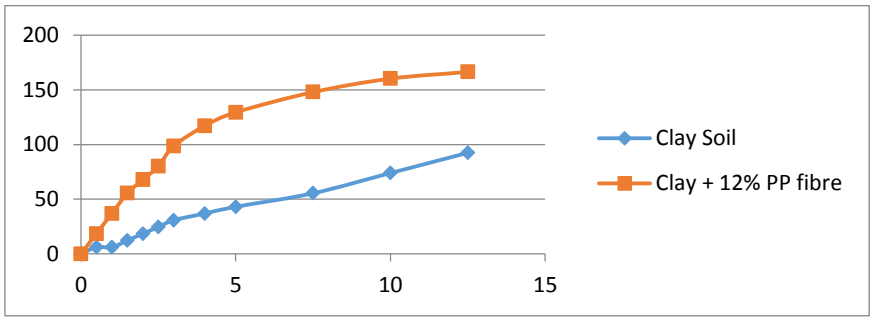

Fig-4: Comparison Graph - CBR for Infiltrated Clay soil

IV. CONCLUSION

This thesis work evaluated the effect of Clay Soil after incorporating of PP Fiber with varying ratio of 6%, 8%, 10%, 12% and 14% with aspect ratio 25, 37.5 and 50 respectively. From these three specimen the optimum of 12% fiber and 37.5 aspect ratio for the PP Fiber was determined and enhance its strength characteristics.

Based on the Test results, the following conclusions have been drawn.

- From the Standard Proctor Compaction test, it has been observed that initially the OMC & MDD of the parent soil were 20% & 1.654 gm/cc respectively.
- In addition by varying the percentage of PP Fiber in the parent soil with the aspect ratio of 6%, 8%,10%, 12% and 14% has been observed that the Optimum Moisture Content of the mixture shows an increasing tendency of 20% and 24% for PP fiber
- The Maximum Dry Density on addition of 6%, 8%,10%, 12% and 14% of PP Fiber decreases from 1.563 g/cc, l.612 g/cc and 1.585 g/cc respectively.
- The Maximum Dry Density shows the decreasing trend with the increase of the PP fiber in the soil mixture. From results it is clear that as Maximum Dry Density decreases and Optimum Moisture Content increases as per the inverse relationship between MDD and OMC.
- From the UCCS test conducted for the same samples, the strength of sample shows increasing tendency with the addition of varying ratios of PP Fiber. For conventional Clay soil strength obtained 0.770 Kg/cm^2
- But for the PP Fiber mixture the strength obtained 1.211 Kg/cm^2, 1.904 Kg/cm^2 and 1.466 Kg/cm^2 respectively.
- The California Bearing Ratio was found to be 2.09% for the conventional Clay soil. Then, the test was

repeated to obtain a CBR value of 6.29% for the optimum point of PP fiber's length.

- In the light of above observation we come to a conclusion that PP Fiber used in the combination with Clay Soil upholds certain remarkable properties which enables it to be used economically for improvement of Clay Soil. Since, PP Fiber is a economical product, usage of the same reduces the environmental pollution and replaces the effect of chemical stabilizers in soil.

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