

Study of Cement Composites on addition of Jute fiber

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Abstract - This paper includes study of various engineering characteristics of Cement Composites when reinforced with jute fiber. Series of experiments such as Test for compressive strength, Test for workability and Test for Consistency with different volume fraction of jute fiber has been performed. And results Indicates Fiber Reinforced Concrete are quite feasible when it comes to low cost construction with definite strength and durability.

Key Words: Jute Fiber, Strength, Economical.

1. INTRODUCTION

It has been seen in developing such as India, there has been acute shortage of durable and low cost housing construction materials. The design of Durable, Low-Cost and Sustainable construction for building is technological challenge in present days. With appropriate use of fiber in cement composites seems feasible to control the inherent problems of cement composites and also for the effective construction. As we all know cement composites lacks in some characteristics such as Cement composites behaves brittle with low tensile strength and due to its poor resistance to cracks opening, need of increase in durability of such composites must be taken in to account with some kind of modification in it. We can make our composites durable by increase the amount of steel in it but it will increase the weight and cost of structure. So here suggestion of addition of fiber in cement composites might work. There are various types of fibers are present in market which can be used as reinforcement in cement concrete such as Steel Fiber, Fiber of Polymer, carbon fiber and there are some natural fiber also like Jute, Sisal, Sugarcane Baggase, rice husk etc. For our experimental purpose we have taken Jute fiber because as a natural

fiber it possess several advantages such as Low cost, Easily available and Eco-Friendly and they also offer High strength and toughness when mix in cement composites.

Jute is abundantly grown in India and it is extracted from a woody type of plant which grows about 2m in height and with a diameter of stem ranges in between 20mm to 30 mm. Jute fiber proves to be cheap, durable and strong and also an effective reinforcing material for cement based composites. This study was done to explore the feasibility of using this indigenous reinforcing material to counter inherent deficiency of cement composites.

2. EXPERIMENTAL STUDY

2.1 Materials

- A. Portland Pozzolona cement was taken of A.C.C Cement. Locally available Coarse Sand and Aggregate were used in cement composites as per Indian Standards.
- B. Naturally occurring Jute Fiber were taken.

2.2 Methodology

The experiment was carried out on M-30 Grade of concrete as per IS:456-2000 with fiber cement ratio 0.5% , 1% , 1.5% and fiber length was taken as 5mm-10mm chopped.

A series of experiments were carried out to study the various engineering characteristics of cement composites on addition Jute fiber.

WORKABILITY TEST:- The slumps for cement composites was carried out on standard slump apparatus.

Discussion:- While mixing with increased ratio of fiber-cement, the slump is going on decreasing due to increase in water absorption capacity of fiber. Based on their experimental behavior we can observed changes in

slumps value with various proportion of fiber where as the slump of M-30 Grade plain concrete is 92mm.

TABLE-1 Slump Test

Fiber-Cement Ratio in (%)	Slump in (mm)
0.5%	71
1.0%	44
1.5%	49

COMPRESSIVE STRENGTH TEST:- The standard cube mould of 150x150x150mm which are properly fitted and lubricated. They are gone for curing for 28 Days and then tested in Universal Testing Machine according to Indian Standards.

Discussion:- The compressive strength of fiber is purely dependent on its own compositions. Also the Cube Compressive Strength of plain concrete comes out to be 40.10 N/mm².

The results for compressive cube test are shown below:-

TABLE-2 Cube Compressive Strength for 28 Days.

Fiber-Cement Ratio in (%)	Compressive Strength in (N/mm ²)
0.5%	48.1
1.0%	44.3
1.5%	45

TEST FOR CONSISTENCY:-Standard consistency of cement means minimum amount of water required to make a plastic mix. Consistency method performed by Vicat Apparatus or by Vicat method with IS:4031 (Part-4) recommendation.

Discussion:-As setting and hardening of cement is continuous process, where initial setting time is the time in which mix lost its plasticity and get stiffened to certain

degree and final setting time means where mix attain sufficient firmness to resist certain amount of pressure. Effect of addition on setting time of cement paste is given below:-

TABLE-3 Setting Time of Cement

Fiber-Cement Ratio in (%)	Stand Consistency (W/C)	W/C for setting time measurement (% of standard consistency)	Initial setting time in (min)	Final setting time in (min)	Difference between Initial and Final setting Time in (min)
0.5%	.395	85	152	190	38
1.0%	.400	85	158	202	44
1.5%	.405	85	169	220	51

3. CONCLUSIONS

The following conclusion could be drawn from above experimental investigation:-

1. With the increase of % of fiber-cement ratio the slump will decrease and increase the workability (**Average=55mm**).
2. The compressive strength of experimental cubes comes out to be higher than that of plain concrete (**Average=46N/mm²**).
3. The difference in Initial setting and final setting time of mix will increased with increased ratio of fiber –cement (**Average of Difference =45 min**).
4. There will be no need of increase of % steel reinforcement in RCC as we get enough strength and durability with the addition of Fiber in cement composites.
5. Jute fiber comes out to cheap and eco-friendly natural fiber and also effective for Low-Cost housing construction.
6. Durability of cement composites increases.
7. Reduction in Cracks propagation occur.

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