Strength Behaviour of M25 Grade Concrete Mixed with Two Natural Fibers in Both Curing and Without Curing Condition

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Abstract— The mixture of cement, fine aggregate coarse aggregate and water are the constituents of concrete of the building materials which can spread or poured into the moulds and forms a stone like mass on hardening. In this project an attempt is made to add natural fibers in the concrete and compare the compressive strengths of concrete. Coir, jute, can be utilized in concrete and effect of such fibers on properties of concrete can be analyzed. Concrete containing fibers increase the service life and have a positive effect on social life and social economy. Concrete is strong in Compression as aggregate efficiently carries the compression load. Concrete is strong in compression but weak in tension, hence by adding these fibers we can also increase its tensile strength. It has been accepted that addition of small closely spaced and uniformly distributed fibers to concrete would act as a crack arrester and would significantly improve its static and dynamic properties. The study also focuses on the comparative study among fiber added concrete with the structural strength of conventional concrete. In this project, the strength behavior of concrete mixed with natural like coir and jute fibers of fiber cement ratio 0.5%, 1.0%, and 1.5% is compared with the compressive strength of conventional concrete of grade M_{25} is subjected to curing and without curing condition. The strength behavior of different fibers concrete will be compared.

Keywords: Compressive Strength, Conventional Concrete, Different Fibers, Fiber Cement Ratio.

I. INTRODUCTION

It is difficult to maintain strength of concrete and increase its durability, so addition of waste fibers is an economical way to increase strength of concrete. The addition of fibers into the mixture of concrete counteracts its brittleness, produces a material with increased compressive strength, tensile performance flexural strength and other benefits like improve ductility and reduction in steel reinforcement requirement. The characteristic of fiber reinforced concrete is different with different fibrous materials. Fibers increase the structural integrity of concrete. The economy, efficiency, durability and rigidity of reinforced concrete make it an attractive material for a wide range of structural application. The only disadvantage of cement concrete is its brittleness, with relatively low enduringness and poor resistance to crack gap and propagation and negligible elongation at break. to beat these discrepancies reinforcement with spread fibers may play a vital role to soak up mechanical impact, cracking thanks to each plastic shrinkage and drying shrinkage. They additionally cut back the porousness of concrete and so cut back hemorrhage of water. Some kinds of fibers manufacture larger impact, abrasion and shatter resistance in concrete. Fibers square measure typically utilized in concrete to manage cracking thanks to plastic shrinkage impact of fibers in concrete and to drying shrinkage. They additionally cut back the porousness of concrete and so cut back hemorrhage of water. Some kinds of fibers manufacture larger impact–, abrasion–, and shatter–resistance in concrete. usually fibers don't increase the flexural strength of concrete, then cannot replace moment–resisting or steel reinforcement. Indeed, some fibers really cut back the strength of concrete.

II. OBJECTIVE

- The study is completed to search out the mechanical properties of typical concrete and fiber concrete and to thus the properties of concrete victimization fiber by exchange cement with various proportion of fiber & finding strength variation on concrete in several combine proportions.
- To reduce the production cost of concrete in terms of natural resources and economical.
- Natural fibers are cheap and locally available in many countries. So, their use as a construction material for increasing properties of concrete and costs are very little.
- The use of natural fibers in rural construction activities will results in economic structures which will be stronger and more durable there by solving one of the major deficiencies in rural structures.
- By adding of fibers in concrete to increase their bonding in between aggregate and fiber, thereby increasing compressive strength.
- The objective of study was to determine and compare the difference in properties of concrete containing with fibers and without fibers.

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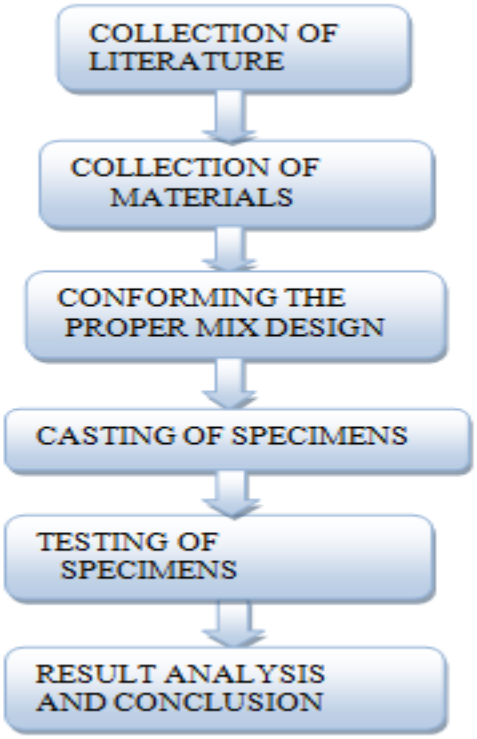
III. METHODOLOGY AND MATERIALS FOR PROJECTS

3.1 Methodology



3.2 Materials For The Project

3.2.1 Cement

Portland cement is far by the most common type of cement in general use around the world. Portland cement is a basic ingredient of a concrete, mortar and non specialty grout. The most common use for Portland cement is in the production of concrete is a composite material consisting of aggregate (gravel and sand), cement, and water. As a construction material, concrete can be cast in almost any shape desired.

3.2.2 Fine Aggregate

Fine aggregates are essentially sands received from the land or the marine environment. Fine aggregate commonly consist regarding natural sand then beaten pitch together with nearly particles opposite shore through a 4.75 mm sieve, as like together with contemptible amount this may stay out of primary, secondary then recycled sources

3.2.3 Coarse Aggregate

Coarse aggregate are particles greater than 4.74mm, but generally range between 9.5mm to 37.5mm in diameter. They can either be form primary, secondary or recycled sources.

3.2.4 Coir Fiber

Coir fiber is removed from the husk of coconut and utilized in items, for example, floor mats, doormats, brushes and sleeping cushions. Coir is the stringy material found between the hard, inner shell and external layer of a coconut. This fiber is exceptionally shabby and locally accessible in numerous nations.

3.2.5 Jute Fiber

The strands are first concentrate by retting. Jute is extraordinary interest because of its efficiency, delicateness, length, lustier and consistently of its fiber. It is long, soft & shiny vegetable fiber having off-white to brown color. High tensile strength & low extensibility are some key properties of jute fiber.

IV. MIX DESIGN & RESULTS

a) Grade of Concrete: M25
b) Type of cement: OPC 53 Grade
c) Maximum nominal size of aggregate: 20mm
d) Minimum cement content: 300 kg/m^3 (IS 456:2000)
e) Maximum water-cement ratio: 0.50 (Table 5 of IS 456:2000)
f) Workability: 100mm slump
g) Exposure condition: Moderate (For Reinforced Concrete)
h) Method of concrete placing: Pumping
j) Degree of supervision: Good
k) Type of aggregate: Crushed Angular Aggregates
m) Maximum cement content: 340 kg/m^3

Final mix ratio

Ingredients	Cement	Fine aggregate	Coarse aggregate	W/C ratio
Ratio	1	1.81	2.49	0.47

V. TEST RESULTS AND ANALYSIS

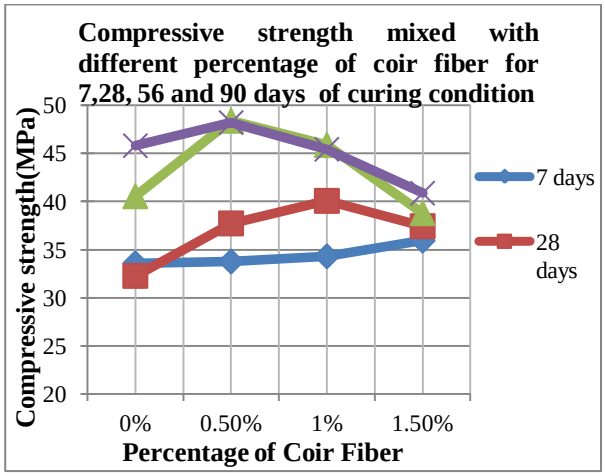
5.1 Compressive Strength Test:

Concrete cube of size 150mm x 150mm x150mm were casted for 0%, 0.5%, 1% and 1.5% of coir and jute fibers. This is done by putting cement paste and spreading smoothly on whole area of specimen. These specimens are tested by compression testing machine after 7, 28, 56, and 90 days of curing and without curing conditions. The load should be applied gradually at the rate of 140 kg/cm² per minute till the specimens fails. Load at the failure divided by the area of specimen gives the compressive strength.

The compressive strength of M25 grade is tested for 7 days, 28 days, 56days and 90 days of curing and without curing conditions and the test results are tabulated and plotted below.

Table.5.1(a) : Values of compressive strength of M_{25} grade concrete with different percentage of coir fiber for 7,28,56 and 90 days at curing condition.

% of fiber	7 days	28 days	56 days	90days
0	33.59	32.28	40.55	45.80
0.5	33.77	37.73	48.39	48.20
1	34.31	40.07	45.87	45.43
1.5	35.94	37.44	38.79	40.87



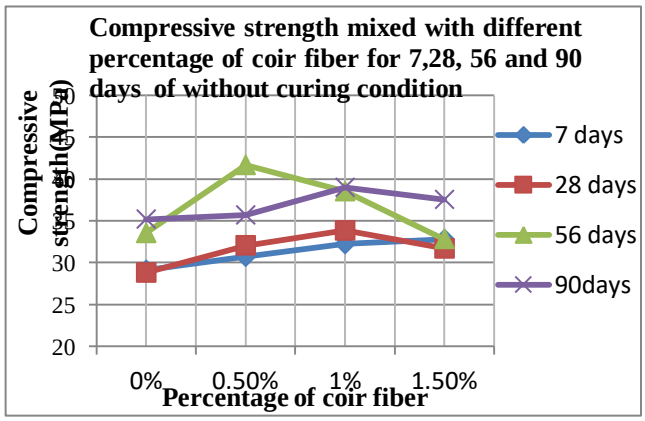
Graph 5.1 compressive strength mixed with different percentage of coir fiber for 7,28,56 and 90 days at curing condition.

Description of Result:

- From graph it is observed that compressive strength increases from 0%to 1.5% by 0.54%, 2.14% and 7% of 7 days.
- In 28 days compressive strength increases from 0%to 1.5% by 16.88%, 24.13% and 15.98%.
- In 56 days compressive strength increases by 19.33%, 13.12% comparing with 0% to 0.5%, 1% and then decreases by 4.34%at 1.5%.
- In 90 days compressive strength increases by 5.24%, comparing with 0% to 0.5%, and then decreases by 0.8%, 10.76% to 1% and 1.5%.

Table5.1(b) : Values of compressive strength of M_{25} grade concrete with different percentage of coir fiber for 7,28,56 and 90 days at without curing condition.

% Of Fiber	7 days	28 days	56 days	90days
0	29.11	28.80	33.53	35.19
0.5	30.70	32.05	41.66	35.68
1	32.21	33.83	38.52	38.98
1.5	32.77	31.68	32.82	37.54

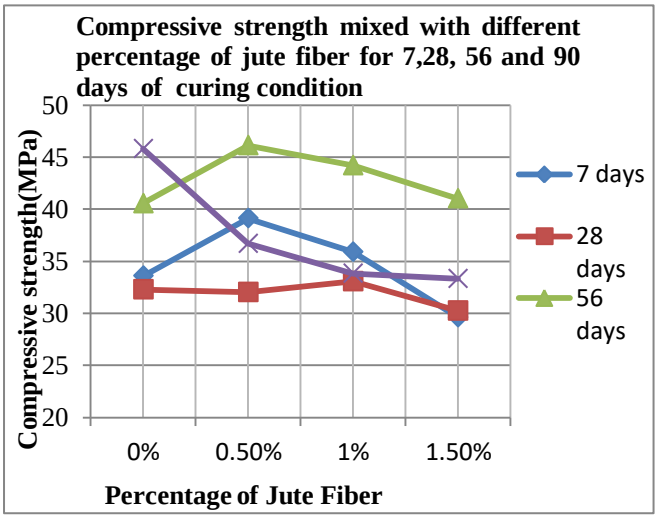


Graph 5.2 compressive strength mixed with different percentage of coir fiber for 7,28,56 and 90 days at without curing condition.

Description of Result:

- From graph it is observed that compressive strength increases from 0%to 1.5% by 5.46%, 10.65% and 12.57%.of 7 days

% of fiber	7 days	28 days	56 days	90days
0	33.59	32.28	40.55	45.80
0.5	39.12	32.02	46.13	36.69
1	35.89	33.06	44.2	33.83
1.5	29.60	30.24	41.02	33.32



- In 28 days compressive strength increases by 11.28%, 17.47% and 10%.comparing with 0% to 0.5%,1% and 1.5%.
- In 56 days compressive strength increases by 24.25%, 14.88% .comparing with 0% to 0.5%, 1% and then decreases by 2.12% at 1.5%.
- In 90 days compressive strength increases by 1.39%, 10.77% and 6.68%.comparing with 0% to 0.5%, 1% and 1.5%.

Table5.1(c) : Values of compressive strength of M_{25} grade concrete with different percentage of jute fiber for 7,28,56 and 90 days at curing condition.

Graph 5.3 Compressive strength mixed with different percentage of jute fiber for 7,28,56 and 90 days at curing condition.

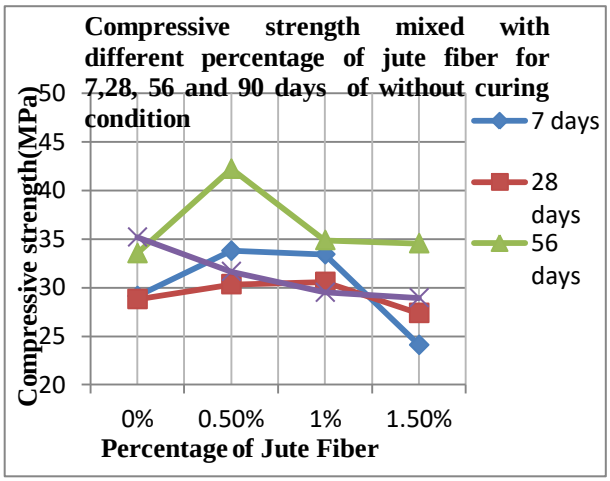
Description of Result:

- From graph it is observed that compressive strength increases by 16.46%, 6.85% comparing with 0% to 0.5% and 1% then decreases by 11.88% at 1.5%.of 7days.
- In 28 days compressive strength decreases by 0.81%, from 0% to0.5%, and increases 2.42% from 0%to 1% and then decreases by 6.32% at 1.5%
- In 56 days compressive strength increases by 13.76%, 9%,1.16% comparing with 0% to 0.5 %,1% and 1.5%

- In 90 days compressive strength decreases by 19.89%, 26.14%,27.25% comparing with 0% to 0.5 %,1% and 1.5%

Table5.1(d) : Values of compressive strength of M25 grade concrete with different percentage of jute fiber for 7,28,56 and 90 days at without curing condition.

% of fiber	7 days	28 days	56 days	90days
0	29.11	28.80	33.53	35.19
0.5	33.77	30.33	42.22	31.65
1	33.41	30.56	34.88	29.49
1.5	24.08	27.37	34.55	28.94



Graph 5.4 Compressive strength mixed with different percentage of jute fiber for 7,28,56 and 90 days at without curing condition.

Description of Result:

- From graph it is observed that compressive strength increases by 16%, 14.77% comparing with 0% to 0.5%, and 1% then decreases by 17.28%% at 1.5%.at 7 days.
- In 28 days compressive strength increases by 5.31%, 6.11% comparing with 0% to 0.5 %, and 1% then decreases by 4.97% at 1.5%.
- In 56 days compressive strength increases by 25.92%, 4.03%,3.04% comparing with 0% to 0.5 %, 1% and 1.5%
- In 90 days compressive strength decreases by 10.06%, 16.20%,17.76% comparing with 0% to 0.5 %,1% and 1.5%

VI. CONCLUSION

- On the basis of 7 days test results in both curing and without curing condition, using jute fibers concrete compressive strength increasing from conventional to 0.5% fiber concrete & then strength are in decreasing order. In using coir fiber, strength are increasing from conventional to 1.5% fiber concrete
- On the basis of 28 days test results in jute fiber compressive strength are increasing from 0% fiber to 1% fiber concrete & then decreasing but in coir fiber concrete on both curing and without curing condition compressive strength are increasing from 0% to 1% fiber concrete & then decreasing.
- On the basis of 56 days fiber concrete results on both curing and without curing conditions using of coir and jute fibers compressive strength are increasing order from 0% fiber to 0.5% & then it is decreased.
- On the basis of 90 days fiber concrete results on both curing and without curing condition using jute fibers compressive strength are in decreasing order from conventional concrete to different percentage of fiber concrete. In coir fiber on curing condition compressive strength increasing up to 0.5% and then decreasing and on without curing condition strength are in increasing order from conventional to 1% fiber concrete & then decreasing

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