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Strengthening the Properties of Concrete using Banana Fiber and Coconut Fiber

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ABSTRACT

This is an experimental research on the homes of coconut fibers and banana fibers mreinforced concrete with simple concrete of M20 grade. Fiber strengthened concrete is a composite cloth consisting of combinations of cement, mortar, or concrete and discontinuous, discrete, uniformly dispersed appropriate fibers. Some of the fibers that may want to be used are metal fibers, polypropylene, nylon, asbestos, coir, glass and carbon. Fiber reinforcement is oftentimes used to supply longevity and ductility to brittle cementations matrices. Natural fibers such as coconut fibers and banana fibers broadly reachable global in massive quantity. This find out about offers use of agricultural waste fabric into concrete, which stronger the residences of concrete and makes surroundings eco- friendly. The addition of coconut fibers and banana fibers extended the engineering residences of the concrete sturdiness and tensile strength. Coconut fibers and banana fibers are environmental pleasant and existing essential attributes such as low density, mild weight, low cost, non –corrosiveness, excessive tensile strength. In this find out about coconut fibers 80% and banana fibers 20% as composite had been brought to M20 grade concrete in specific share 0%, 0.5% 1.5%, 2.0%, 2.5%, by way of weight of cement. The widespread cubes, cylinders, and beams for traditional concrete and coconut fibers and banana fibers bolstered concrete had been organized and examined in the laboratory. Mechanical homes such as compressive, break up tensile and flexural power have been determined. The end result suggests that, compressive strength, cut up tensile energy and flexural energy marginally improved.

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1. INTRODUCTION

Concrete is the most broadly used development fabric all over the world with improvements in science and technological know-how in building industry, the scope of concrete as a structural material, has widened. Since concrete is vulnerable in anxiety and flexure most commonly, it is strengthened the usage of metal reinforcing bars. However utilization of metal reinforcement is expensive. Considerable efforts have been made international to add a number kinds of fibers to concrete so to make it extra robust long lasting and economical. Plain concrete is a brittle material. Concrete except any fibers will boost cracks due to plastic shrinkage, drying shrinkage and adjustments in quantity of concrete. Development of these micro cracks motives elastic deformation of concrete. In order to meet the required values of flexural strength, fibers are used in ordinary concrete. The addition of fibers in simple concrete will manipulate the cracking due to shrinkage and additionally minimize the bleeding of water in concrete. Natural fiber such as coconut fiber; banana fiber has positive bodily and mechanical traits that can be utilized successfully in the improvement of strengthened concrete material.

2. MATERIALS USED

Cement: Ordinary Portland Cement of 53 grade
Fine aggregate: Locally available river sand passing through I.S.S. 4.75mm sieve
Coarse aggregate: Well graded crushed aggregate passing through I.S.S.20mm sieve and retaining on I.S.S.10mm sieve
Coconut fiber: Coconut fiber – extracted from the outer shell of the coconut
Banana fiber: Banana fiber extracted from the outer trunk of banana tree
Water: Fresh clean and potable water.

3. MATERIAL TESTING

Table 3.1 - Properties Of Coarse Aggregate

Properties of coarse aggregate		
S. No.	Property	Value
1	Property	Value
2	Specific gravity	2.70
3	Crushing value	14.6
4	Impact value	2.75%
5	Water absorption	1.2%

3.1. Initial and final setting time test:

- The mould and the non-porous plate are washed, cleaned and dried.
- 400 g of the given sample of cement is kept on the non-porous plate.
- The volume of water equal to 0.85 times the percentage of water required for standard consistency is added very carefully to the dry cement and mixed thoroughly to form a neat cement paste. The mixing is completed within 3 to 5 minutes from the moment of adding water.

At the instant of adding water to the cement. The time taken is noted by using a stop watch.

- The vicat mould is placed on the non-porous plate and is filled with the prepared cement paste and the surface of the pate is made smooth in level with the mould by using a trowel.
- By shaking the mould slightly air if any, is expelled from the sample.
- The non-porous plate and the mould are placed under the needle.
- The needle is gently lowered to touch the surface of the plate and then the indicator adjusted to show zero reading.
- The needle is released quickly allowing it to penetrate in to the paste.
- When the needle comes to rest, the reading on the index scale is noted.

Fig 3.1 Setting time test

4. MIX DESIGN PROPORTION

This method is recommended for designing concrete mix for general types of construction, using the ingredients of concrete normally available. The design is carried out for specified compressive strength and workability of concrete using continuously graded aggregate.

Table 4.1- Mix design proportions for 1 m^3

Water (kg)	Cement (kg)	Fine aggregate (kg)	Coarse aggregate (kg)
197	394	791	1025
0.50	1	2.01	2.60

4.1. CASTING

Cubes of dimension 150mm x150 mm x a hundred and fifty mm, cylinders of measurement 150mm diameter & 300 mm peak and beams of dimension 100mm x 100mm x 500mm have been oiled excellent to stop the sticking of concrete.

The mildew had been stuffed with sparkling concrete one 3rdheight and compacted by means of ability of tamping rod. The equal manner is adopted to fill the last peak of mildew and sooner or later the pinnacle floor is completed clean with trowel.

Fig.4.1 Cube

Fig.4.2 Cylinder

Fig.4.3 Coconut and Banana fiber

Table 4.2 Chemical properties of Banana fibre

CONSTITUENTS	PERCENTAGE (%)
Cellulose	56
Lignin	17
Extractives	7
Moisture	11
Ashes	9

5. RESULTS AND DISCUSSION

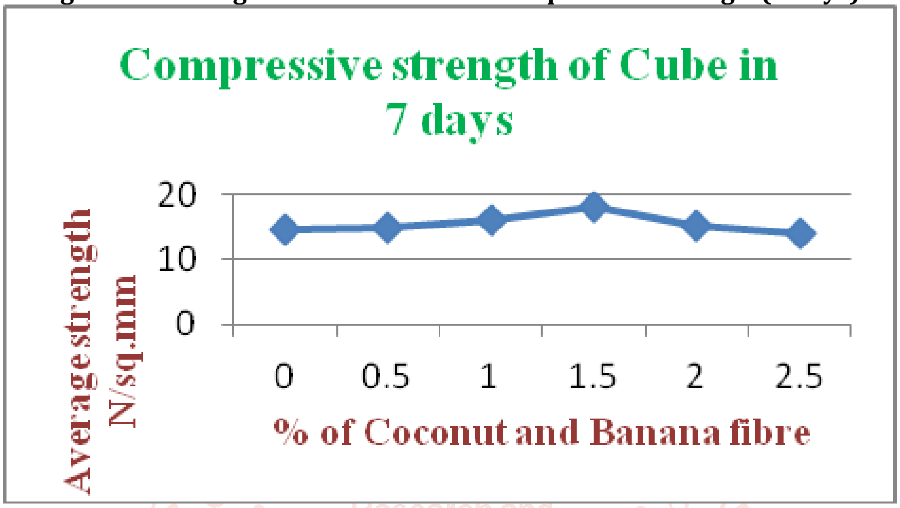
5.1. Compressive Strength Test

Table 5.1 Compressive Strength test results

CUBE					
S. No.	Coconut and Banana in Percentage(%)	Specimen Designation	Age of Concrete In Days	Compressive Strength In N/mm^2	Average Strength In N/mm^2
1	0	C1	7	14.10	14.53
		C2	7	15.4	
		C3	7	14.10	

2	0.5	C1 C2 C3	7 7 7	15.1 14.9 15.1	15.03
3	1.0	C1 C2 C3	7 7 7	16.4 15.8 16.3	16.17
4	1.5	C1 C2 C3	7 7 7	17.2 18.1 18.6	17.97
5	2.0	C1 C2 C3	7 7 7	15.40 15.20 15.30	15.30
6	2.5	C1 C2 C3	7 7 7	14.0 13.9 13.8	13.9

Fig 5.1 Percentage of Natural fibre vs Compressive strength(7 days)



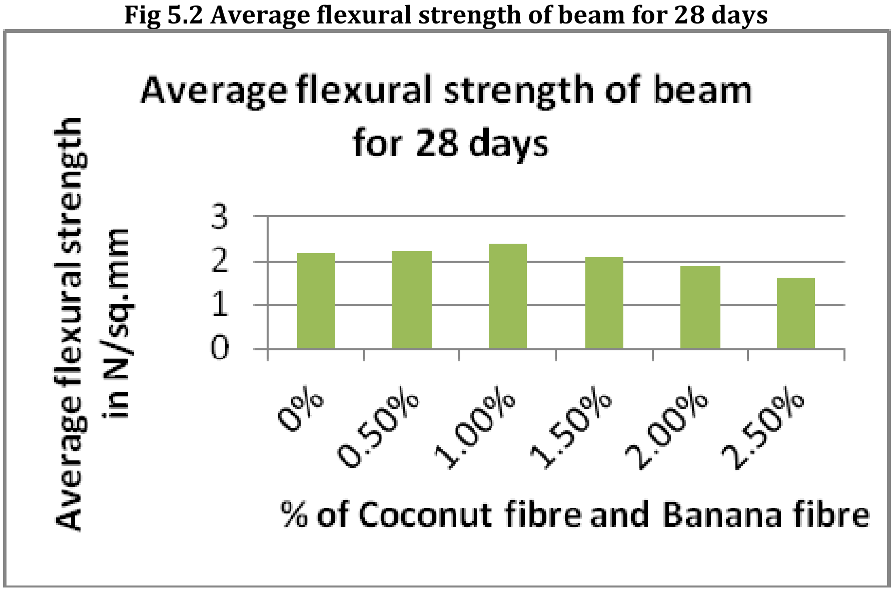
5.2. Cylinder – Split Tensile Strength For 28 Days

Table 5.2 Split tensile strength of cylinder

S. No	Coconut fibre & Banana fibre in Percentage (%)	Compressive strength (Mpa)			Average
		Cylinder 1	Cylinder 2	Cylinder 3	
1	0	2.4	2.7	2.5	2.53
2	0.5	2.8	2.5	2.6	2.63
3	1.0	2.9	2.7	2.8	2.80
4	1.5	2.5	2.2	2.4	2.37
5	2.0	2.4	2.5	2.0	2.30
6	2.5	2.1	2.0	2.1	2.07

5.3. Flexural Strength test

Fig 5.2 Average flexural strength of beam for 28 days

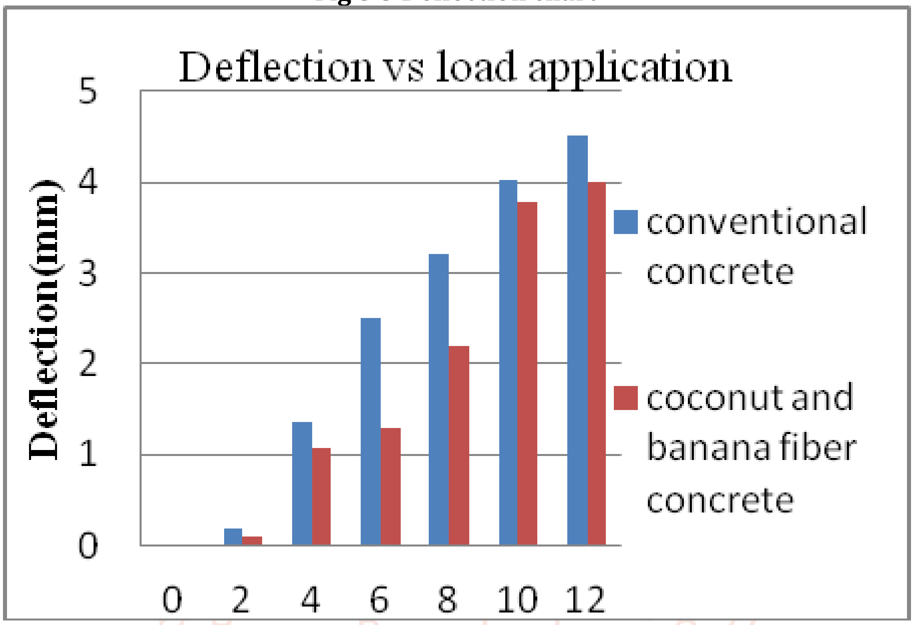


5.4. Flexural Strength Test on Beam for deflection

Table 5.3 Flexural Strength of FRC with Coconut Fibre and banana fiber

Conventional concrete		Coconut and banana fibre concrete(1%)	
Load(KN)	Deflection(mm)	Load(KN)	Deflection(mm)
0	0	0	0
10	0.19	10	0.11
20	1.35	20	1.07
30	2.51	30	1.29
40	3.20	40	2.20
50	4.03	50	3.79
55	4.51	55	4.01

Fig 5.3 Deflection chart



6. CONCULSION

Conclusion

The following conclusions obtained from the experimental investigation,

- It is observed that the workability of fibre reinforced concrete gets reduced as the percentage of natural fibres increases.
- It is observed that compressive strength and split tensile strength on higher side for 1% fibres as compared to that produced from 0%, 0.5%, 1.5%,2% and 2.5% fibres
- It is observed that flexural strength are on higher side for 1% fibres as compared to that produced from 0%, 0.5%, 1%,2% and 2.5% fibres.
- It is observed that compressive strength increases with addition of natural fibres. Compressive strength goes on increasing by increase in natural fibre percentage up to the optimum value. The optimum value of fibre content of steel fibre reinforced concrete was found to be 1%.
- It is observed that flexural strength increases with addition of steel fibres. The flexural strength of concrete goes on increasing with the increase in fibre content up to the optimum value. The optimum value for flexural strength of steel fibre reinforced cement concrete was found to be 1%.
- It is observed that split tensile strength increases with addition of natural fibres. The tensile strength of concrete goes on increasing with the increase in fibre content up to the optimum value. The optimum value for tensile strength of natural fibre reinforced cement concrete was found to be 1%.
- Finally this project concludes the making of natural fibre concrete, the test results show that the addition of natural fibre resulted in a significant increase in concrete compressive strength compared with the control concrete.
- Although the compressive strength values have considerably increased with the addition of used natural fibres, their values are still in the reasonable range for a 0.5%, 1%, 1.5% , 2% and 2.5% values because the intended compressive strengths of (30MPa) flexure strength (8MPa) and tensile strength(4MPa)was achieved in this type of specimen.

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