

BEHAVIOR OF COMBINATION OF COCONUT FIBER AND RECRON FIBER IN CONCRETE

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Abstract

Concrete is strong in compression, as aggregate efficiently carries the compression load. However, it is weak in tension as the cement holding the aggregate in place can crack, allowing the structure to fail. This weakness had been adjusted over many decades by using a system of reinforcing bars (rebar) to create reinforced concrete; so that concrete primarily resists compressive stresses and rebar resist tensile and shear stresses and rebar resist tensile and shear stresses. It has been recognised that addition of small, closely spaced and uniformly distributed fibres to concrete would act as a crack arrester and would significantly improve the its static and dynamic properties

Keywords: fibre, shear stresses, rebar, concrete

1. INTRODUCTION

Fibre reinforced concrete can be defined as composite material consisting of mixture of cement , mortar or concrete and discontinuous, discrete, uniformly dispersed suitable fibres. The use of randomly oriented, short fibres to improve the physical properties of a matrix in an ancient concept. For example, fibres made of straw or jute has been used to improve the properties of bricks for thousands of years. Natural fibres are made from plant, animal and mineral sources. The most used natural fibres are cotton., bamboo and coconut. Metallic fibres are made of either steel or stainless steel. Polymer fibres are subset of man-made fibres, which are based on synthetic chemicals rather than arising natural fibres by purely physical process. Fibre reinforced concrete is increasingly used because of the advantage of increased static and dynamic tensile strength , energy absorbing characteristics and enhanced fatigue strength. The uniformly dispersal of fibres through the concrete provides isotropic properties not common to traditional reinforced concrete. Fibre reinforced concrete has been tried on overlays of air-field, road pavements, industrial floorings, bridge decks , channel lining, explosive resistant structures.

The following are the factors affecting the properties of FRC. The properties of FRC would obviously depend upon the efficient transfer of stress between matrix and fibres, which largely dependent on the

- Type of fibre used
- Orientation of fibre
- Fibre geometry

Recron is a state of art reinforcing material which is used to increase strength in a variety of applications like automotive battery, paper, infiltration fabrics and for improving the quality of construction.

Coconut fibre is extracted from the outer shell of coconut. These fibres are mostly used in products such as floor mats, doormats

1.1 Objective

- To determine the strength of fibre concrete
- To compare the strength of the conventional concrete, coconut fibre and recron fibre concrete
- To do plastering using recron fibre and to reduce the size of the roof slab, beams and columns

1.2 Scope

- Fibres can be used precast flyover
- Replacing fibres in construction
- Crack should be arrested during hydration
- Fibres are used for airport pavements

1.3 Mix Design

Table 2 Mix design

Water cement ratio (lit)	Cement content (kg)	Fine aggregate content (kg)	Coarse aggregate content(kg)
212.12	406.0	624.14	1032.27
0.52	1	1.537	2.542

The various materials used in this project work are shown in the table 3 below

1.4 Material Properties

Table 3 Properties of materials used

S.No	Description	Parameter
1	Grade of concrete	M20
2	cement	OPC 53 grade IS 269-1976

3	Fine aggregate	Sand conforming to zone II of IS 383-1978
4	Coarse aggregate	10-12 mm nominal size
5	Type and shape of CA	Angular
6	w/c ratio	0.52
7	Steel fiber	Undulated (0.6mm dia and 36mm length)
8	Polypropylene fiber	Bar chip fibers (42mm length)
9	Age of curing	7 days, 14 days and 28 days

2. RESULTS AND DISCUSSION

2.1 Test Results for Compressive Strength

The coconut fibre and recron fibre are mixed with PCC in different fibre volume to cast cubes and the fibre volume showing average compressive strength. The test results shows the 7, 14, 28 days compressive strength of coconut fibre , recron fibre and mixed with PCC. From the results increase in strength has been obtained in hybrid fibre in 28 days. The decrease in strength had been obtained in coconut fibre in 28 days

Table 4 Test results of compressive strength (7, 14 and 28 days)

Type of fibre	No.of days	Compressive strength in N/mm ²	
		Fibre percentage	
		0.5	1.0
Coconut fibre	7 days	16.42	17.67
	14 days	18.06	19.49
	28 days	20.17	20.80
Recron fibre	7 days	16.67	18.67
	14 days	18.49	21.49
	28 days	20.24	23.56
Hybrid fibre	7 days	16.48	18.57
	14 days	20.11	22.85
	28 days	21.08	24.24

Table 5 Test results of tensile strength (7, 14 and 28 days)

Type of fibre	No.of days	Split tensile strength in N/mm ²	
		Fibre percentage	
		0.5	1.0
Coconut fibre	7 days	1.66	1.65
	14 days	2.26	2.74
	28 days	2.61	3.19
Recron fibre	7 days	1.58	2.09
	14 days	2.43	2.85
	28 days	2.83	3.17
Hybrid fibre	7 days	1.74	1.81
	14 days	2.67	2.78
	28 days	3.1	3.23

Table 6 Test results of flexural strength (7, 14 and 28 days)

Type of fibre	No.of days	Split tensile strength in N/mm ²	
		Fibre percentage	
		0.5	1.0
Coconut fibre	7 days	2.02	2.10
	14 days	2.52	3.48
	28 days	2.83	4.06
Recron fibre	7 days	1.86	2.35
	14 days	2.86	3.15
	28 days	3.33	3.94
Hybrid fibre	7 days	2.07	2.31
	14 days	3.18	3.54
	28 days	3.7	4.12

The FRC cubes with fibre volume of 1% achieved maximum flexural strength for coconut fibre , recon fibre and hybrid fibre respectively. Henceforth, for further studies in strength behaviour of beam 1% fibre volume will be used. The flexural strength represents the highest stress experienced within the material at its moment of rupture. The flexural strength would be the same as the tensile strength if the material were homogenous.

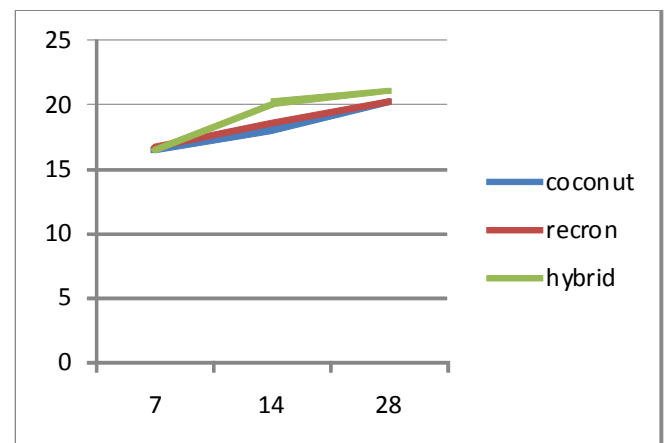


Fig 1 Compressive strength of 0.5% mixed coconut, recron & hybrid fibre

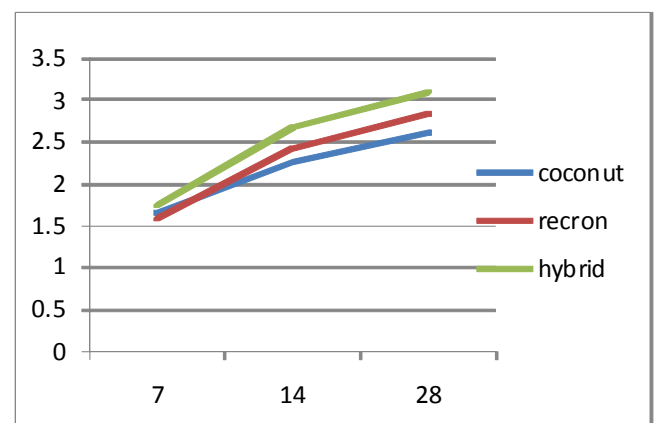


Fig 2 Split tensile strength of 0.5% mixed coconut, recron & hybrid fibre

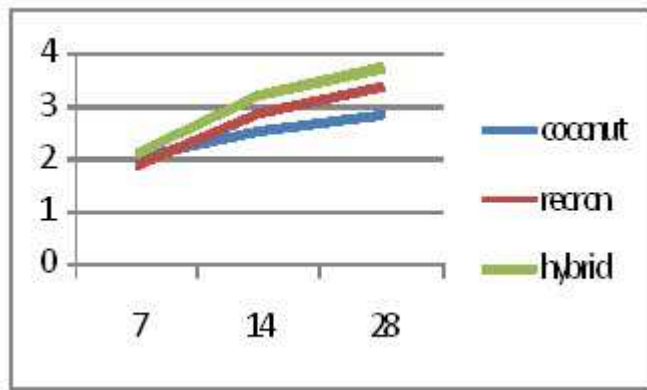


Fig 3 Flexural strength of 0.5% mixed coconut, recron & hybrid fibre

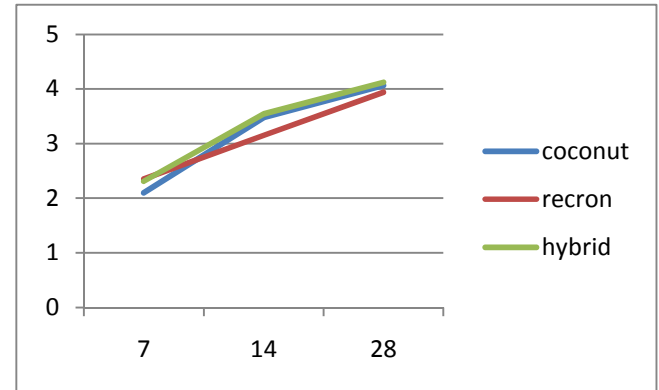


Fig 6 Flexural strength of 1% mixed coconut, recron & hybrid fibre

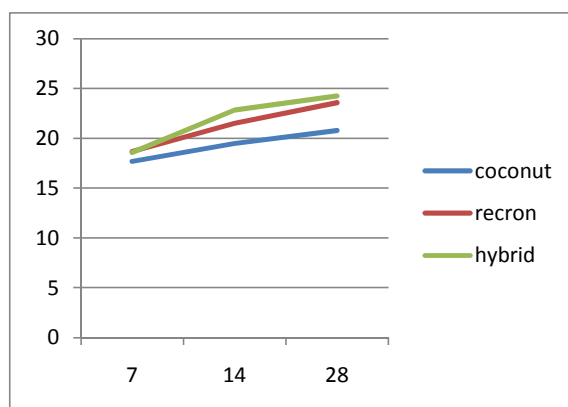


Fig 4 Compressive strength of 1% mixed coconut, recron & hybrid fibre

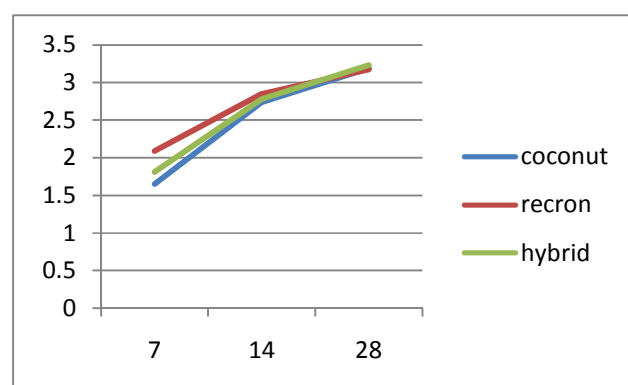


Fig 5 Split tensile strength of 1% mixed coconut, recron & hybrid fibre

3. CONCLUSION

Based on the results obtained in the present study and the discussion of the following conclusions are made:

- Compressive strength test are carried on FRC cubes with varying fibre quantity confirms that the maximum tensile strength is attained when the fibre quantity is 1% for coconut fibre and 1% for recron fibre
- Split tensile strength test are carried on FRC cylinders with varying fibre quantity confirms that the maximum tensile strength is attained when the fibre quantity is 1% for coconut fibre and 1% for recron fibre
- Flexural tensile strength test are carried on FRC beams with varying fibre quantity confirms that the maximum tensile strength is attained when the fibre quantity is 1% for coconut fibre and 1% for recron fibre
- Addition of recron fibre and coconut fibre into PCC increased the split tensile strength of concrete upto 1.36 times and 1.55 times

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