Experimental Study on Behavior of Recron Fibre Reinforced Concrete

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Abstract— the use of conglomerate cement is becoming open space in these days liability to the tackles made by the professorate in the direction of implementation of resources, which are obtainable in natural plentifully. The novel additions Recron 3s, which is tried in recent times without any scientific study, was found to be sufficient. While, there is much to be done in order to systematize the properties of the said additives. An attempt is made in the present work to investigate of these additives on the compressive strength and Split Tensile Strength of cement concrete. The main purpose of this study to investigate the influence of additives recron 3s (fiber). The strength characteristics of the concrete (M30) were used with varying percentage of additives was worked out giving certain proportions by adding Recron fibre in the percentage of 0%,0.5%,1% to the concrete mix and changes in strength, strength get increases and workability parameters were studied. In the present work, an effort is made to use new additives as the ingredients of concrete and study the effects on M30 grade concrete. The scope of work is limited to find out the behavior of concrete in compression and tension and results were obtained.

Index Terms— Recron Fibre, Compression Strength, Split Tensile Strength, Concrete, Aggregate, water absorption, Sieve.

1 INTRODUCTION

Generally concrete is good in compression but weak in tension. Natural fibre reinforcement structural can be one solution, which requires suitable quantities of fibre in concrete. Certain quantity of fibre can be beneficial for enhancing the properties of plain concrete is not necessary that all properties will be improved the additional of fibre may increase certain properties and at the same time may decrease other once. Recron fibre helps in improving soil subgrade strength of silty soil [1]. According to Indian standard code for "Plain and Reinforced Concrete -Code of Practice" Is 456:2000 a medium strength concrete is in range of M25-M55 [2]. Therefore the fibre in appropriate quantity should be selected (i.e.) fibre content of 2% and 4% and 6% and 8% by weight of cement and having a length of 6.0cm are used to prepare for CFRC specimens. Natural fibres and Recron fibres can be one possible material, as they are cheap and locally available in many countries. Though these fibres are ecologically advantageous, they have some limitations such as lower durability and lesser strength [3]. The paper reports the behaviour of the recron fiber. Such material would increase the service life and reduce the life cost of the structure.

Recron fiber was used as a secondary reinforcement material. It arrests shrinkage cracks and increases resistance to water penetration, abrasion and impact. It makes concrete homogenous and improves the ductility, compressive strength, and flexural strength together with improving the ability to absorb more energy.Use of uniformly dispersed Recron fibres reduces bleeding and segregation, resulting in a more homogeneous mix. This leads to better strength and reduced permeability which improves the durability. The physical properties of Recron fiber are given below.

The main aim of the research on sustainable materials is to investigate the use of artificial fibre (Recron fibre) with concrete mixes to improve the performance of construction components and reduce the depletion in natural condition [4]. The result is depend on the sustainable building design since, when compared with regular cement or concrete mixes

1.1 Advantage of Recron Fiber

- Improves homogeneity of the concrete by reducing segregation of aggregates.
- Reduces shrinkage cracks/micro cracks
- Abrasion resistance increases by more than 25%.
- Impact and shatter resistance increases by 100%
- Increases ductility, compressive, flexural and tensile strength
- Reduces water permeability which helps prevent correction of primary steel
- Increases energy absorption capability of concrete.
- Replaces or reduces non-structural steel in floors, roads and pavement i.e. slab on grade helps increases joint spacing.

1.2 Properties of Recron Fiber

Product type Polyester	CT2012
Cross section	Triangular
Length	6mm
Dispersion	Excellent
Acid resistance	Excellent
Melting point	250 degree Celsius

2 Experimental Study

2.1 Sieve Analysis Test for Fine Aggregate

TABLE 1
Fineness Modulus of Fine Aggregate

No	Sieve size (mm)	Weight of retained	% of weight retained	Cumulative of % retained	% of passing
1	4.75	108	21.6	21.6	78.4
2	2.36	103	20.6	42.6	57.8
3	1.18	77	15.4	57.6	42.4
4	0.6	50	10	67.6	32.4
5	0.3	66	11.2	80.8	19.2
6	0.15	72	14.4	95.2	4.8
7	0.075	16	3.2	98.4	1.6
8	Pan	8	1.6	100	0
Fineness modulus of fine aggregate				5.638	

To determine the particles size of given aggregates being obtained from the source with help of sieve shaker apparatus [4, 5], Fineness modulus of the given fine aggregate = 5.638

2.2 Sieve Analysis Test for Coarse Aggregate

To determine the particles size of given aggregates being obtained from the source with help of sieve shaker apparatus [4, 5], Fineness modulus of the given Coarse aggregate = 6.775

TABLE 2
Fineness Modulus of Coarse Aggregate

Sl. No	Sieve size in mm	Weight of retained	% of weight retained	Cumulative of % retained	% of passing
1	80	0	0	0	100
2	40	0	0	0	100
3	20	20.5	2.05	2.05	97.25
4	10	734	73.4	75.45	24.55
5	4.75	245.5	24.55	100	0
6	2.36	0	0	100	0
7	1.18	0	0	100	0
8	0.6	0	0	100	0
9	0.3	0	0	100	0
10	0.15	0	0	100	0
Fineness modulus of coarse aggregate				6.775	

2.3 Water absorption test

To determine the water absorption of the coarse aggregate, Materials used are Coarse aggregate, Weighing Balance, Water tank, Temperature heat of 22°C and 32°C. Average Water Absorption Percentage = (1+1.3263+1.0152)/3 = 1.11%

Table 3 Showa the Water absortion value, the value ranges between 0.1% to 2% as per IS 2386-Part 3
Therefore, the water absorption percentage = 1.11%

TABLE 3
Observation of Water Content

No	Observation (kg)	Trial I	Trial II	Trial III
1	Wt. of Container	0.965	0.965	0.965
2	Wt. of Container + Sample	2.965	2.850	2.935
3	Wt. of Basket + Coarse aggregate soaked for 24hrs	2.990	2.885	2.960
4	Wt. of the Basket + Coarse aggregate in saturated condition	2.970	2.860	2.940
5	% of water absorption	1	1.326	1.015

2.4 Mix Proportion of Concrete

Table 3 shows the mix proportions of the concrete with the standard procedure

TABLE 3
Mix Proportion of the Concrete

	Cement	Fine Aggregate	Course Aggregate	Water
Ratio	1	1.4	208	0.45
Kg/m³	413	600	1190	186

2.5 Curing of the Concrete Cubes.

Preparation of concrete is to assemble the moulds and apply a light coat of oil to the inner faces. Compute the quantities of materials required for casting .Weight out the individual quantity of cement, sand and aggregate for the given concrete ratio. Spread the weighed quantity of sand on a non-absorbent level surface, add the cement and mix them thoroughly. Spread the coarse aggregate and sand cement mixture and turn them by a trowel or shovel to obtain a uniform mix.

Add the quantity of water and mix till a mass of uniform colour and consistency is obtained [10]. Now fill the moulds in four layers of concrete, each layer is compacted not less than 35 stokes by tamping rods. Level the top surface of mould with trowel. After 24 hours, remove the moulded specimen from the mould. The specimens from the moulds are immediately submerged in clean water for curing. (7 days, 14 days and 28 days).

2.6 Curing of the Cylinder Concrete.

Test specimens are stored in water at a temperature of 24^0C to 30^0C for 48 hours before testing. Immediately remove from water and keep in the wet condition and dimension is measured before the it keep in wet condition. The cylindrical specimen is placed horizontally between the loading surfaces of a compression testing machine. Narrow packing strips of suitable material such as plywood is used to reduce the high compression stresses. The load is applied without shock and increasing continuously at a rate of the specimen.

3 RESULT AND DISCUSSION

3.1 Compressive Strength of Recron Fibre Concrete Cubes

The compressive strength of the Recron Fibre concrete is tested on the three days with four different percentage of recron fibre mixing, they are 0,0.5,1 percentage of Fibre is mixed with the concrete cubes. And three trials have been made the value of compressive strength is shown in the table 4 with 7, 14 and 28 days of curing the concrete.

TABLE 4
COMPRESSIVE STRENGTH OF RECRON FIBRE CONCRETE CUBES FOR 7, 14 & 28 DAYS

Recron fibre	Trials	Loads (KN)	Average Load	Compressive Strength (N/mm²)	Loads (KN)	Average Load	Compressive Strength (N/mm²)	Load (kN)	Average load	Compressive strength (N/mm²)
		7 Days			14 Days			28 Days		
0%	1	400	400	17.77	520	510	22.66	700	696.7	30.96
	2	390			500			690		
	3	410			510			700		
0.50%	1	400	416.7	18.52	560	543.3	24.18	700	716.7	31.85
	2	430			530			730		
	3	420			540			720		
1.00%	1	440	446.7	19.85	570	570	25.33	740	746.7	33.19
	2	460			560			760		
	3	440			580			740		

The graphs have been plotted for the compressive strength vs. percentage of recron fibre mixing. In the observation of the graph shows that the increases percentage of Fibre mixes increases the compressive strength values. The figure 1 shows the compressive strength testing machine for the concrete cube.

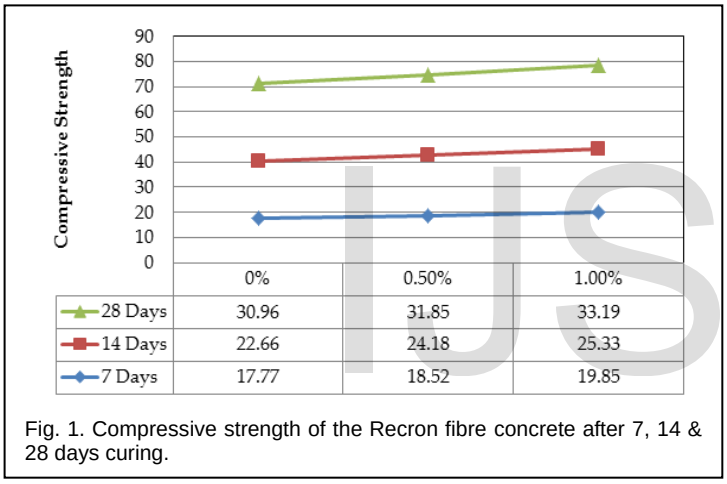

Fig. 1. Compressive strength of the Recron fibre concrete after 7, 14 & 28 days curing.

3.2 Split Tensile Strength of Recron Fibre Concrete Cylinder.

The cylindrical specimen is placed horizontally between the loading surfaces of a compression testing machine. Narrow packing strips of suitable material such as plywood is used to reduce the high compression stresses. The load is applied without shock and increasing continuously at a rate of the specimen.

TABLE 5
SPLIT TENSILE STRENGTH OF RECRON FIBRE CONCRETE CUBES FOR 7, 14 & 28 DAYS

Recron Fibre (%)	Load In kN	Split Tensile Strength (N/mm²)	Load In kN	Split Tensile Strength (N/mm²)	Load In kN	Split Tensile Strength (N/mm²)
	7 Days		14 Days		28 Days	
0	150	2.12	110	1.56	200	2.83
0.5	170	2.41	130	1.84	220	3.12
1	190	2.69	140	1.98	240	3.4

The load is increased until the specimen fails and the maximum load applied to the specimen during the test is recorded, the figure 2 shows the split tensile testing machine for the concrete cylinder.

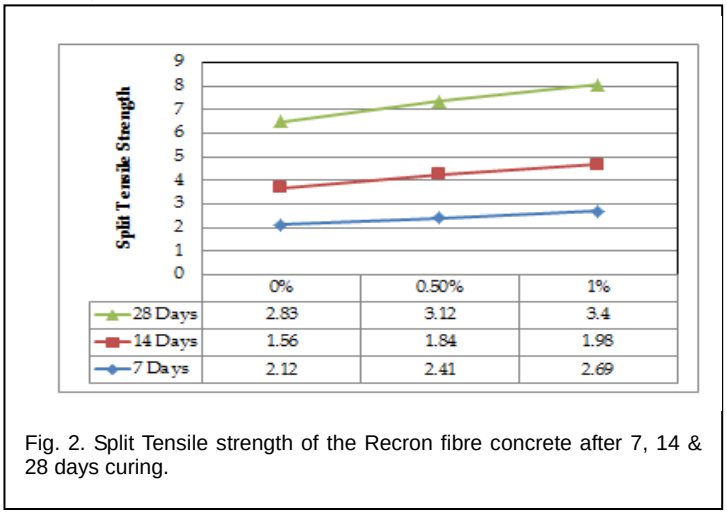

Fig. 2. Split Tensile strength of the Recron fibre concrete after 7, 14 & 28 days curing.

4 CONCLUSION

Concrete is one of the most important elements of construction field. But it's must be having a proper binding actions and economic for all sides of construction activities. Based on the investigation for various concentration of recron fibre and the concrete cured for 28 days, the following conclusions can drawn,

On addition of 1% of Recron fiber the maximum compressive strength of 33.19 N/mm² is achieved thus increase in compressive strength is 7.20 % than the conventional concrete. The increase in split tensile strength is 20.15% than the conventional concrete. Thus we concluded that the optimum dosage of Recron fibre that can be added in concrete is 1%.

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