

## **COMPARISON OF COMPRESSIVE STRENGTH OF COIR-REINFORCED CONCRETE AND PLAIN CEMENT CONCRETE**

<sup>1</sup>Varsha meena, <sup>2</sup>Ashish Swami<sup>3</sup>, Mahendra Kumar

<sup>1,2</sup>M.Tech scholar at Vivekananda global university Jaipur

<sup>3</sup>Assitant professor at Vivekananda global university jaipur 302017

**ABSTRACT-** *In civil engineering world, concrete is an inevitable and broadly used building material. As we know, concrete is good in compression but weaker in tension, there is a need of materials that can be mix with concrete to provide its better tensile strength. In addition to that in today's world, the increase in global warming and pollution increases the requirement of natural eco-friendly composites to minimize the effect of pollution. Among all natural fibres, coconut fibre (coir) has maximum tensile strength due to presence of maximum amount of lignin. This paper presents an experimental study of coir fibre reinforced concrete (CFRC) and its strength. Addition of coir fibre in the concrete increases the various properties of concrete like its compressive strength, tensile strength and split tensile strength.*

**Keywords:** *Coir fibre, natural fibre, coir fibre reinforced concrete (CFRC), Compressive strength, tensile strength.*

### **I. Introduction**

Concrete is broadly and normally used building material. Concrete is good in compression but weak in tension because it is a very brittle material and has very low toughness. Therefore, cracks are generated whenever load raises the stresses that exceed the tensile strength of concrete. Various fibres are added nowadays to increase the properties of concrete against the tension. Generally, steel and synthetic fibres like glass are used but despite of their advantages they have high material costs, high and typical man power and adverse environmental impact. This gives space to use some natural fibres to enhance the properties of concrete without affecting the environment adversely. In this study, coir fibres are used as a substitute of these synthetic fibres and different properties of concrete like compressive strength, flexural strength are determined and compared to normal plain cement concrete (PCC). Here three different quantities of coir fibres (1%, 2%, 3%) by weight of cement are used to make coir fibre reinforced concrete (CFRC). We see that at first the strength increases but as we increase the fibre content the strength starts decreasing after some point. Here that fiber contents is determined which gives better strength as compared to normal PCC.

### **II. LITERATURE REVIEWS**

Shreeshail.B.H, Jaydeep Chougale, Dhanraj Pimple, Amar Kulkarni (2014)[1] have studied on "Effect of coconut fibres on the properties of concrete". They come to know that by the presence of 2% of coir in M30 mix have shown increment in compressive, split-tensile strength and modulus of rupture. Effect of coconut fibres on the properties of concrete". He observed that workability decreases with increase in fibre content for both fresh & recycled aggregate, but more with recycled aggregate.

Both for fresh and recycled brick aggregate compressive, split-tensile, & rupture strain limit was increases with incorporation of 0.5% of G.I. fiber. D.M. Parbhane, S.B. Shinde (2014)[3] have studied on "Strength properties of coir fibre concrete." They come to know that slump and compaction factor value increases but workability of CF is less when compared to conventional mix. Max. split-tensile strength was obtained at 4% of coir addition Md.Abid Alam, Imran Ahmad, Fazlur Rehman (2015)[4] have studied on "Experimental study on properties of glass fibre reinforced concrete." They found that the presence of 0.06% fibre has shown substantial improvement in compressive (cube) & tensile (cylinder) strength. Palkannan. S, Thirumurugan. A, Ramesh. K (2015) [5] have studied on "A comparative study of hybrid fiber reinforced concrete with plain cement concrete". They come to know that hybrid of (0.8% steel+0.2% coconut.) given the max. Compressive, split & flexural strength. Tejas R Patil, ajay N. Burile (2016)[6] have studied on "Comparative study of steel and glass fibre reinforced concrete composites". They found that by the incorporation of 0.5% of HSF of length 50mm, max. Compressive, split – tensile strength for M20 mix was obtained. Ratio of cylinder to cube for compressive strength obtained was 3:4. Dosage of varying % of HSF of length 35mm lowers the workability. Crack size in split & deflections in flexural test reduces by the usage of GF than HSF. Rajeev banerjee, S Arshad razanaqvi, Swati srivastava (2016) [7] have studied on "Use of glass and coconut fibres in enhancing properties of concrete". They observed for 2% of mono Coconut and 0.08% mono glass fibre max. compressive

strength was obtained. Hybrid (0.08% glass + 1% coconut) gives max. Compressive & tensile strength. K. Dharunsankar, S. Saravanan (2016) [8] studied on "An experimental study on concrete with hybrid fibers." They come to know that high flexure, split & compressive strength was obtained at the incorporation of 1% of coir & steel fiber. Further addition of fibers beyond 1% is not recommended.

### III. MATERIALS USED

**Cement:**

Ordinary Portland cement (OPC) of 43 grades was used and tested for physical and chemical properties as per IS: 4031-1931 whose specific gravity is 3.14.

**Coarse aggregate:**

The crushed coarse aggregate of 20 mm maximum size rounded obtained from the local site is used whose specific gravity is 2.65.

**Fine aggregate:**

Locally available sand which is free from impurities used. Sand passing through 4.75 mm sieve and retained on 150 micron IS sieve is used.

**Coir Fibres:**

Locally available coir fibres in the bundles at shops are used here. The coir fibres are cut into random pieces of and soaked in water for 24 hours before using and used in the proportion of 1%, 2% and 3 % by weight of cement.

**Water:**

Water should be free from any organic and chemical impurities like acid, alkalis, oils, greases.

### IV. MIX DESIGN

M-20 grade concrete is adopted for casting CFRC and PCC. The mix design is carried out on the basis of IS: 10262-1982. The mix proportion obtained as per mix design is water: cement: fine aggregate: coarse aggregate= 0.45: 1: 1.68: 2.44 respectively.

The proportion for casting remains same for both PCC and CFRC. Only difference in the methodology for CFRC was that cement. Aggregate and random chopped coir fibres were mixed in a dry state followed by addition of water so that uniform mixing can be achieved whereas PCC was casted by conventional mixture method.



### V. RESULTS FOR TEST METHODS:

**COMPRESSIVE STRENGTH:** Compressive strength of concrete is defined as the resistance against axial loading. For this , test cubes of dimensions 150 mm×150 mm × 150 mm are casted. 3 cubes for each proportion of coir fibre were casted- 0% , 1% ,2% , 3% at 7 days and 14 days and 28 days .The results for compressive strength test are given below in the table.

Calculation of compressive strength=axial load / cross- section area of cube.

**Table: 1 Compressive strength**

Curing days	0% CF	1% CF	2% CF	3% CF
7 days	34.21	35.84	33.40	30.95
14 days	45.35	46.96	44.02	41.18
28 days	64.44	66.17	63.29	59.08

### VI. CONCLUSION

1. By using coir fibres the properties can be enhanced.
2. Coir fibres increase flexibility and tensile strength of concrete
3. At 1% fibre content, the strength of concrete is Maximum

4. As quantity of fibre increases the strength of concrete starts decreasing beyond 1% fibre content. So fibre should not be used in concrete beyond 1%.

## **VII. REFERENCES**

1. Shreeshail.B.H, Jaydeep Chougale, Dhanraj Pimple, Amar Kulkarni (2014)- Effect of coconut fibres on the properties of concrete.
2. D.M. Parbhane, S.B. Shinde (2014) have studied on "Strength properties of coir fibre concrete.
3. Md.Abid Alam, Imran Ahmad, Fazlur Rehman (2015) have studied on "Experimental study on properties of glass fibre reinforced concrete.
4. Palkannan. S, Thirumurugan. A, Ramesh. K (2015) have studied on "A comparative study of hybrid fiber reinforced concrete with plain cement concrete".
5. Tejas R Patil, ajay N. Burile (2016) have studied on "Comparative study of steel and glass fibre reinforced concrete composites.
6. Rajeev banerjee, S Arshad razanaqvi, Swati srivastava (2016) have studied on "Use of glass and coconut fibres in enhancing properties of concrete.
7. K. Dharunsankar, S. Saravanan (2016) [8] studied on "An experimental study on concrete with hybrid fibers.