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Improvement in Strength of Concrete with Natural Fibers (Coir) & Artificial Fibers (Steel)

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ABSTRACT: This paper reports on a comprehensive study on the strength of concrete containing coir and steel fibers. Properties studied Include workability of fresh concrete, compressive strength, flexural tensile strength, splitting tensile strength, modulus of elasticity for hardened concrete. To improve the strength of concrete steel fibers were added and fiber volume fraction was 0%, 0.25%, 0.5%, 0.75% and 1.0% in weight basis. Coir fibers have higher tensile strength as compared to other natural fibers, as the coir does not break easily with hand. To improve the strength of concrete coir fibers were added and fiber weight fraction was 1.0%, 2.0%, 3.0%, and 4.0% in volume basis The laboratory results shown that steel fiber addition into Portland cement concrete Improve the tensile strength properties. However, it reduced workability. In case of coir fibers though the workability reduces both tensile and compressive strength increases.
Keywords: Coir, compressive strength, split tensile strength, flexural strength, workability.

I. INTRODUCTION

The addition of fibers to concrete considerably improves its structural characteristics such as flexura strength, impact strength, tensile strength, ductility and flexural toughness Coconut fiber is one of the natural fibers abundantly available in tropical regions, and is extracted from the husk of coconut fruit. Not only the physical, chemical and mechanical properties of coconut fibers are shown; but also properties of composites (cement pastes, mortar and/or concrete etc), in which coconut fibers are used as reinforcement, are discussed. The aim of this review is to spread awareness of coconut fibers as a construction material in civil engineering. The versatility and applications of coconut fibers in different fields is discussed in detail. Coconut fibers are reported as most ductile and energy absorbent material. It is concluded that coconut fibers have the potential to be used in composites for different purposes. Since the use of coconut fibers has given some marvelous products, there is still possibility of the invention of new products containing coconut fibers with improved results. In civil engineering, coconut fibers have been used as reinforcement in composites for on-structural components. There is a need of investigating the behavior of coconut fiber reinforced concrete to be used in main structural components like beams and columns.

The Objectives Of Present Study Are.

1. To find the optimum mix design with regards to the amount of water, coir fibers, steel fibers and water cement ratio required.
2. To investigate the physical properties of the Coir and steel fiber reinforced concrete – density (Lightweight), strength (bending and compression), water absorption and moisture Content
3. Use of waste in a useful manner.
4. To provide economical construction material.
5. Provide safeguard to the environment by utilizing waste properly.

Experimental Programme

Experimental programme comprises of test on cement, COIR fibers, and cement concrete with partial replacement of cement with and Coir

A. Materials

B. Cement

The cement used was Ordinary Portland cement (43Grade) with a specific gravity of 3.16. Initial and final setting times of the cement were 140 min and 205 min, respectively. Its chemical composition is given in Table 1.

D. Aggregate

Good quality river sand was used as a fine aggregate. The fineness modulus, specific gravity and dry density are 2.32, 2.68 and 1690 kg/m3.Coarse aggregate passing through 20mm and retained 10mm sieve was used. Its specific gravity and dry density was 2.7 and 1550 kg/m3. E. Fibers Steel fiber having low carbon and

its both end were hooked were used. The steel fibers have a length of 30 mm, diameter of 0.60 mm, aspect ratio of 50, and density of 7.85 g/cm3. Collect from Stewols Pvt. Ltd. Nagpur. COIR (COCONUT FIBERS): The coconut is the fruit of the Cocos nucifera, a tropical plant of the Arecaceae (Palmae) family.

Table3: Mechanical Properties Of Coconut Fiber (As per ACI 544.1R-96) Manual of concrete practice

PROPERTIES	**VALUES**
Fiber length(mm)	50-110
Fiber diameter(mm)	0.1-0.406
Specific Gravity	1.12-1.15
Elongation (%)	10-25
Modulus of elasticity(ksi)	2750-3770
Average tensile strength(N/mm^2)	150

Tests On Fresh Concrete

An M20 mix is designed as per guidelines in IS 10262, 1982 based on the preliminary studies conducted in the constituent materials. Tests on fresh concrete are obtained as follows:

Tests	Results
Slump Test	116mm
Vee Bee Time	9 Sec.
Compaction Factor Test	0.93.
Flow Test	74

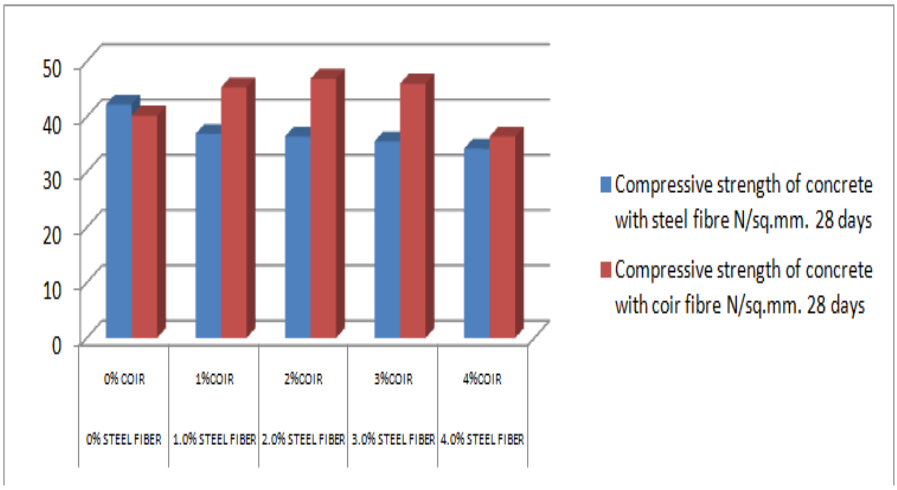
Tests on hardened concrete Compressivw strength test:

Three specimens for each are cast with different percentages of steel fiber mixed with the gradual increase from **0.0%, 0.25%, 0.5%, 0.75% and 1.0% by volume** and coir fiber with gradual increase from 0.0%,1.0%,2.0%,3.0% &4.0% by replacing the cement .

Mix	**Compressive strength of concrete N/sq.mm.**			
	7 DAYS	**14 DAYS**	**28 DAYS**	**90 DAYS**
M25+0% COIR	24.50	25.80	40.22	42.00
M25+1%COIR	23.50	26.22	45.33	48.88
M25+2%COIR	25.55	28.33	46.88	49.1
M25+3%COIR	23.22	26.66	46.0	48.00
M25+4%COIR	23.00	25.00	36.44	45.00

Mix	**Compressive strength of concrete N/sq.mm.**			
	7 DAYS	**14 DAYS**	**28 DAYS**	**90 DAYS**
M25+0% STEEL FIBER	23.56	24.89	42.22	40.00
M25+1.0% STEEL FIBER	22.67	23.02	36.89	40.00
M25+2.0% STEEL FIBER	22.22	22.89	36.44	37.78

M25+3.0% STEEL FIBER	21.56	22.67	35.56	36.44
M25+4.0% STEEL FIBER	21.33	22.22	34.22	34.67

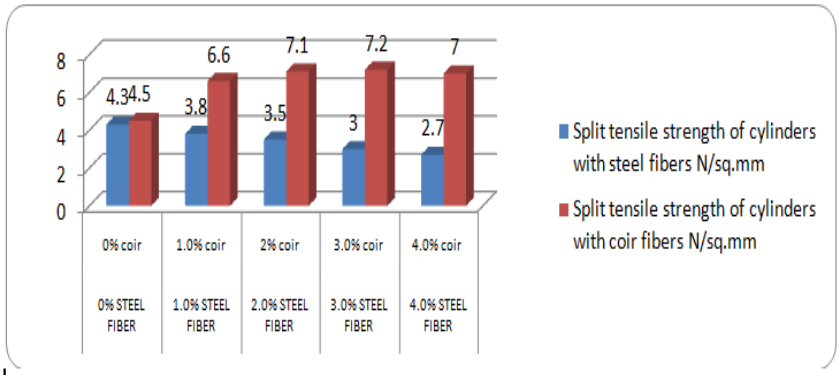


Split Tensile Strength Of Cylinders:

Cylinders are tested after 28 days of curing for Split Tensile Strength. The maximum strength is given by the mix of 15%RHA+3%COIR.It is observed that the addition of RHA and COIR fibers increases the Split Tensile Strength of concrete by 46%,and Coir alone increases the strength up to 44%.It is also observed that at failure load the cylinders of the control specimens is split or crush very easily but the cylinders of the mix containing fibers still kept intact even after failure.

Mix	**Split tensile strength of cylinders N/sq.mm**
M25+1%COIR	4.6
M25+1%COIR	6.6
M25+2%COIR	7.1
M25+3%COIR	7.2
M25+4%COIR	7

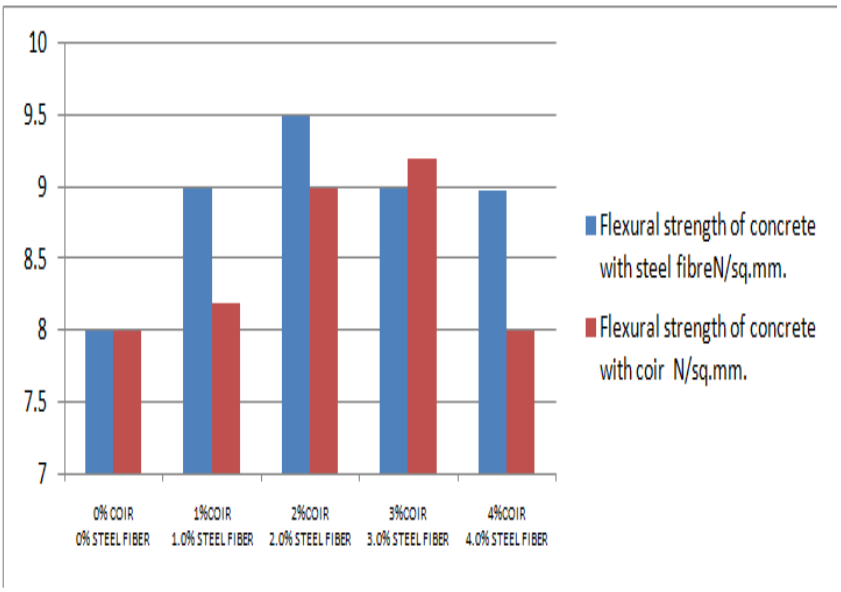
Mix	Split tensile strength of cylinders N/sq.mm
M25+0% STEEL FIBER	4.2
M25+0.25% STEEL FIBER	3.8
M25+0.5% STEEL FIBER	3.5
M25+0.75% STEEL FIBER	3
M25+1.0% STEEL FIBER	2.7



Flexural strength :

Mix	**Flexural strength of concrete N/sq.mm.**
M25+0% COIR	8
M25+1%COIR	9
M25+2%COIR	9.5
M25+3%COIR	9
M25+4%COIR	8.98

Mix	**Flexural strength of concrete N/sq.mm.**
M25+0% STEEL FIBER	8
M25+0.25% STEEL FIBER	8.2
M25+0.5% STEEL FIBER	9
M25+0.75% STEEL FIBER	9.2
M25+1.0% STEEL FIBER	8



Addition of coir by 2.0% & 3.0% considerably increase the flexural strength as compared to the steel fibers.

II.RESULT

1. Increase in the compressive strength of the concrete after the addition of the both coir and steel fibers
2. Considerable increase in the split tensile strength of the concrete up to 44 % for the coir at 3%
3. Flexural strength increased up to double with the addition of 2.0% coir as compared to steel fibers.

II. CONCLUSION

1. Coir fibers show most promising results at 2.0% to 3.0% addition as compared to the steel fibers.
2. Mixing of both the fibers will slightly reduce the workability of the mix.

3. Addition of fibers can be the effective way to utilize waste and reducing the cement content.

REFERENCES

[1]. Study of Various Characteristic of Concrete with Rice Husk Ash As A Partial Replacement Of Cement With Natural Fibers (Coir) Pravin V Domke, Sandesh D Deshmukh,Satish D kene. R.S.Deotale
[2]. "Rice Husk Ash – Properties and its Uses: A Review" by A. Muthadhi, R. Anita and Dr. S.
[3]. Kothandaraman.
[4]. Building Materials in India: 50 years, A Commemorative Volume, Edited by T. N. Gupta, 1998.
[5]. Proceedings of International Training Course on, Materials design and production processes for Low Cost Housing, Trivandrum, India, 27- 31 March, 2001.
[6]. International Conference, Waste and By products as Secondary Resources for Building Materials, 13-16 April, 1999, New Delhi, India.
[7]. IS 10262 -1981 "IS Method of Mix Design", Bureau of Indian Standards, New Delhi 10. IS 516 -1959 "Methods
[8]. of Tests for strength of concrete", Bureau of Indian Standards, New Delhi
[9]. IS 456 -2000 "Code of Practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi.
[10]. Experimental Study on Strength of Concrete by Using Artificial Fibers with Rice Husk AsH Sandesh D. Deshmukh.1, Pravin V.Domke.2 , Satish D. Kene.3 , R.S.Deotale4
[11]. Rice Husk Ash – Properties and its Uses : A Review" by Muthadhi, R. Anita and Dr. S. Kothandaraman