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Reviewing Mechanical Properties of Coconut Fiber Reinforced Self Compacting Concrete with Steel Fibers

Ravinder Kumar

B Tech (Civil), Kurukshetra University

Abstract: High stream capacity concrete is that solid which under its own particular weight with no vibration or effect fills every one of the parts of the formwork .Such cement is known as self compacting concrete. In this examination, the impact of coconut filaments and crossover blend of coconut strands and steel filaments taking low steel fiber content, on the new and solidified properties of Self Compacting Concrete is contemplated. Likewise in the areas where odds of earth tremor are predominant, structure needs a pliable conduct. Among the common strands, coconut filaments have the most noteworthy strength. What's more, coconut fiber is a waste material having no cost so can be utilized as a fortification in concrete. Blend plan quality of 20MPa is considered. Mechanical properties, for example, compressive quality, split elasticity and flexural quality were resolved utilizing solid shape example of 150mm, barrel example of 150mm X 300mm and crystal example of 100mm x 100mm X 500mm individually. As per the examinations comes about it is discovered that the workability diminishes as the fiber content increments. Coconut fiber strengthened self compacting concrete indicated increment in compressive quality and flexural quality with increase in fiber content contrasted with typical self-compacting concrete and half breed mixes. The half breed blends demonstrated an expansion in split rigidity with increment in fiber content contrasted with coconut fiber fortified self-compacting concrete and ordinary self-compacting concrete.

Keywords— Steel fibers ,Coconut fibers, , Normal self-compacting concrete (NSCC), Steel fiber reinforced self-compacting concrete (SFRSCC) Coconut fiber reinforced self-compacting concrete (CFRSCC), and Hybrid fiber reinforced self-compacting concrete (HFRSCC).

I. INTRODUCTION

In today's time concrete has become one of the most popular construction materials in worldwide, the reason being that the raw materials of cement are available widely in different places around the world and also it is considered to be a man-made material. Also cement plays a major role in the sustainable construction, as less effort is required in its manufacturing. These facts and points have resulted in many inventions in the field of concrete and have also led to studies which improve its quality, reducing the implementation cost and making the concrete friendly with the environment, without amending its aesthetical appearance when it is used as a structural construction member.

Nowadays, it can be seen that as a result of the research being in progress in concrete technology, many types of concrete such as Ultra High strength concrete, High Performance Concrete, Architectural Concrete, Light Weight Concrete and Self compacting concrete (SCC) are commonly known among engineering society and also among ordinary people . In this prospective, more awareness and more knowledge regarding the concrete types should be taken into account. In fact, civil engineers at present should have more awareness and information about concrete types so as to be able to keep themselves updated with the most recent developments, future prospects and new technological innovations.

SCC can be considered as one of the most recent developing types of contemporary concrete. It is an innovative concrete mixture that can be mold into place without any use of vibrators so as to form a product that is free of voids within the formwork. It is commercially known by various names such as self-leveling concrete, self-compacting concrete, self-consolidating concrete or rheoplastic concrete.

II. EXPERIMENTAL PROGRAM

Materials Used

1) Ordinary Portland Cement
   In this investigation Ordinary Portland cement of 43 Grade was used.
2) Fly Ash
   Fly Ash has been used as a replacement for cement in this study.
3) Admixtures
   Super plasticizer based on poly carboxylic ether polymer was used.
4) Fine Aggregate
   Locally available find sand was used in the investigation.
5) Coarse Aggregate
   In the study 12.5 mm size crushed angular aggregates were used. The Angular aggregate provides good

interlocking with other aggregates and hence gives more strength.

6) Steel Fibers
Hooked end steel fibers of 0.6 mm diameter and 35 mm in length were used in the study.

7) Coconut Fibers
Brown coconut fibers of 50 mm length and 0.25 mm diameter were used for this study.

Experimental Work

The Compressive strength, split tensile strength and flexural strength of all the samples are given in table no. 3.1 . The graphs were plotted with corresponding table shown in figure no. 3.1, 3.2,and 3.3 for different combinations of steel and coconut fibres concrete mixes. In this study, compressive strength, tensile strength and flexural strength was measured as per recommendation of IS code. For testing the compressive strength of concrete, 24 cubes of 150mm X 150 mm X 150 mm dimensions were casted and tested for 28 days curing. The compressive strength of concrete is measured 28 days. For split tensile strength 24 cylinders of size 150mm X 300mm were casted and tested. Flexural strength test was carried out by casting 24 beams of size 100mm X 100mm X 500mm.

Mix Proportion

The mix design proportioning for all mixes are detailed in table 2.1

Table 2.1 : Mix design proportioning for design mixes

S.no.	Materials	NSCC	SFRSCC	CFRSCC 1	CFRSCC 2	CFRSCC 3	HFRSCC 1	HFRSCC 2	HFRSCC 3
1	Cement	325	325	325	325	325	325	325	325
2	Fine Aggregates	980	980	980	980	980	980	980	980
3	Coarse aggregates	840	840	840	840	840	840	840	840
4	Fly ash	90	90	90	90	90	90	90	90
5	Super plasticizer	3.31	3.31	3.31	3.31	3.31	3.31	3.31	3.31
6	Water Content	185	185	185	185	185	185	185	185
7	Steel Fibers	0	0.5	0	0	0	0.5	0.5	0.5
8	Coconut Fibers	0	0	0.5	0.75	1.0	0.5	0.75	1.0

III. RESULTS

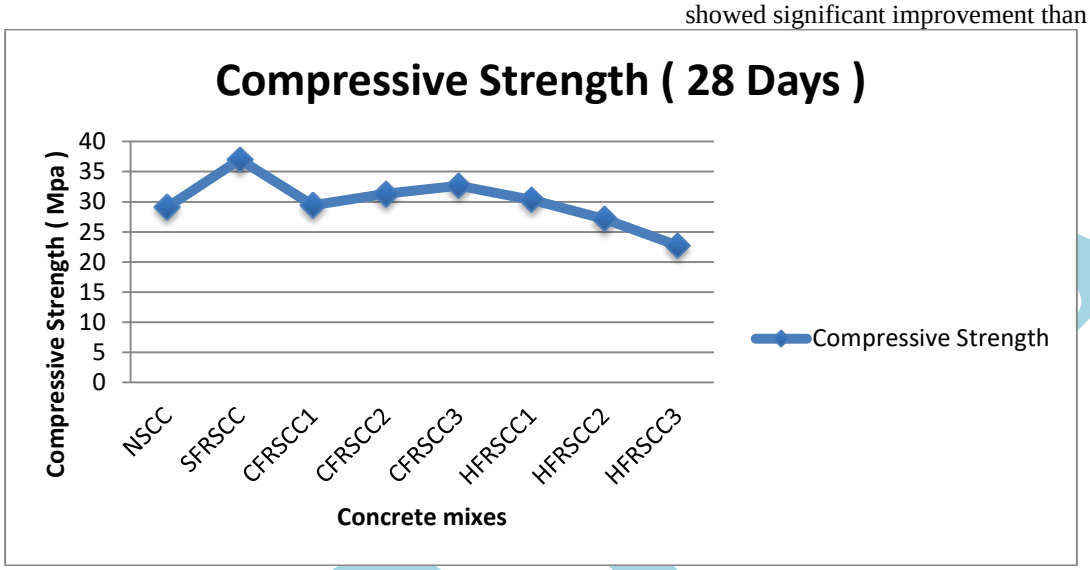
Hardened Properties of concrete: Hardened properties of all concrete mixes such as Compressive Strength, Split tensile strength and Flexural strength were tested. Table 3.1 shows the results of the hardened properties.

Mix	Compressive strength (Mpa) (28 days)	Split tensile strength (Mpa) (28 days)	Flexural Strength (Mpa) (28 days)
NSCC	29.10	2.20	6.8
SFRSCC	37.01	3.64	7.7
CFRSCC1	29.43	2.55	7.4
CFRSCC2	31.31	2.45	7.5
CFRSCC3	32.68	2.40	8.0
HFRSCC1	30.33	4.05	7.9
HFRSCC2	27.15	2.96	7.7
HFRSCC3	22.71	3.15	7.4

Table 3.1 Hardened properties result

Compressive strength

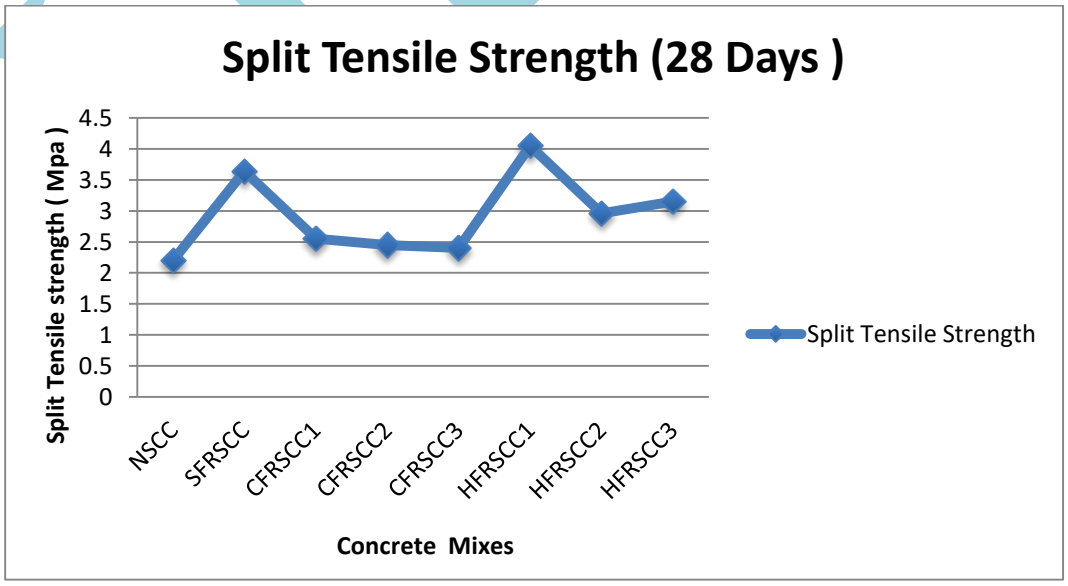
1. For 28 days compressive strength, there was an increase in the strength with the addition of steel fibers.
2. For the case of coconut fiber mixes the compressive strength of the mixes showed increase in the compressive strength with the increase in the fiber content but the strength was less than the steel fiber self compacting concrete mix.
3. The percentage increase in the compressive strength with reference to NSCC is 27.2 % in SFRSCC, 12.3 % in CFRSCC3 and 4.2 % in HFRSCC1.
4. HFRSCC3 showed 22 % decrease in the compressive strength compared to NSCC. No mix showed significant improvement than SFRSCC.



Graph 3.1 : Compressive strength results

Split tensile Strength

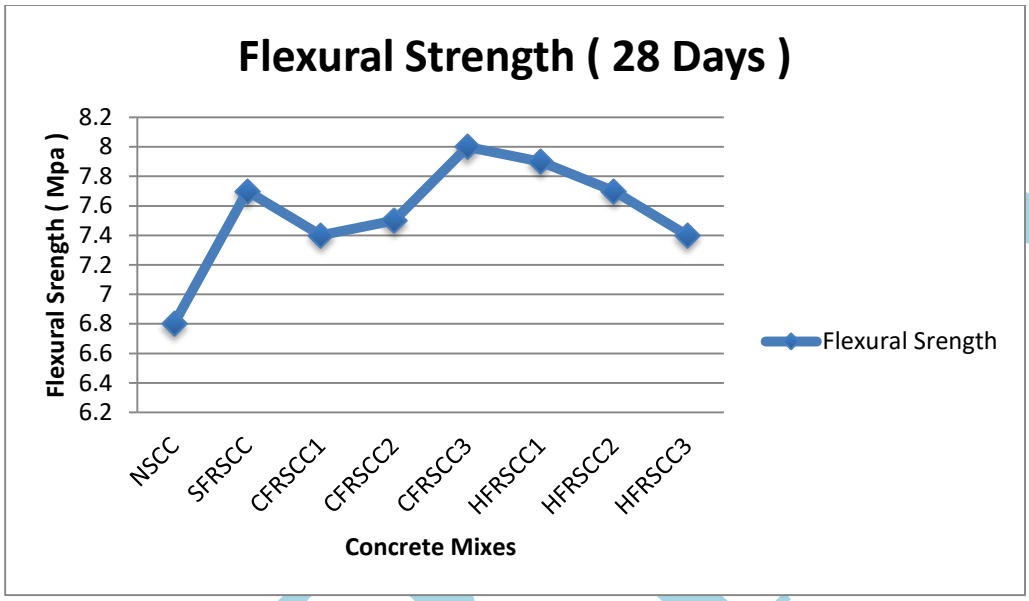
1. With the addition of steel fibers there is increase in the tensile strength value.
2. The percentage increase in the tensile strength with reference to NSCC is 65.5 % in SFRSCC, 16 % in CFRSCC1, and 84.1 % in HFRSCC.
3. Also HFRSCC showed an increase of 11.3 % in tensile strength as compared to SFRSCC.



Graph 3.2 : Split tensile strength results

Flexural Strength

1. In case of SFRSCC there is an increase in the flexural strength with the addition of steel fibers.
2. For the CFRSCC mixes there is an increase in the flexural strength as the percentage of fibers is increased.
3. The percentage increase in the flexural strength as compared to the NSCC is 13.2 % in SFRSCC, 17.65 % in CFRSCC3 and 16.2 % in HFRSCC1.
4. Also the percentage increase in the flexural strength with reference to SFRSCC is 3.9 % in CFRSCC3 and 2.6 % in HFRSCC1.



Graph 3.3 : Flexural strength results

IV. CONCLUSION

1. Using steel fibers and coconut fibers with different proportions there was a decrease in the workability.
2. However in the case of compressive strength the value increases for coconut reinforced self compacting concrete but the compressive strength decreases for hybrid fiber reinforced self compacting concrete as compared to NSCC, SFRSCC and CFRSCC.
3. Addition of fibers improves the splitting tensile strength and flexural strength for all the concrete mixes.

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