STUDY AND PERFORMANCE OF HIGH STRENGTH CONCRETE BY ADDING ADMIXTURE

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Abstract : Since the old occasions, numerous has examines and progressions were conveyed to upgrade the physical and mechanical properties of concrete. Fiber reinforced concrete is one among those advancements which offers a convenient, functional and economical technique for beating smaller scale splits and comparable sort of lacks. Since concrete is not tension free, thus a few estimates must be received to beat this inadequacy.Human hair is by and large solid in strain; consequently it very well may be utilized as a fiber fortification material. Human hair fiber is an option non-degradable issue accessible in bounty and at modest expense. It likewise makes natural issues. Analyses were led on solid light emissions sizes with the expansion of different rates of human hair fiber i.e., 0.5%, 1%, 1.5% by weight of cement, fine and coarse total and the results were contrasted and high strength concrete of M60 Grade. For every level of human hair added in concrete, 3 beams were tried for their individual mechanical properties at relieving times of 3 days, 7 days, 28 days. The change in mechanical properties of cement is resolved and investigated. The outcomes got demonstrate to us that the ideal substance of human hair fiber to be added to M60 review of concrete is 0.5%, 1%, 1.5% weight of cement, fine and coarse total together and therefore there has been a noteworthy increment in mechanical properties of concrete.The 100% of concrete mix to the natural coarse aggregate in concrete with 150X150X700 mm beams were cast with target flexural strength is 60M pa. The 28 days flexural strength was crushed at 3, 7, 28 days are reported.

IndexTerms **- Human hair fiber, workability, Flexural strength, Fiber reinforced concrete, High strength concrete.**

I. INTRODUCTION

Concrete is an extremely heterogeneous material delivered by the mixer of finely powdered cement, aggregates of different sizes and water with characteristic physical, chemical and mechanical properties. At present, the scientists underline on Nanotechnology to fabricate another type of concrete materials that could achieve the practical concrete structures. Progression of materials is must for improved execution of extraordinary building applications and changing the mass condition of materials with respect to the compounds or microstructure or Nanostructure. It has been the setting up a course to synthesize new materials. Concrete is the most usually utilized development material in India with yearly utilization more than 100 million cubic meters. It is eminent that the common cement characterized as concerns Compressive quality don't meet a few helpful particulars, for example, impermeability, security from ice, thermal splitting sufficiently. Concrete typically named as Normal strength concrete (NSC), high strength concrete (HSC) and ultra high strength cement (UHSC).

Fibre Reinforced Concrete (FRC) is concrete containing fibrous material which increases as structural and is gaining importance. It contains short, discrete fibres that are uniformly distributed and randomly oriented. The concept of using fibres as reinforcement is not new. Fibres have been used as reinforced since ancient times. Historically, horsehair was used in mortar and straw in mud bricks. In the early 1900s, asbestos fibres were used in concrete, and in the 1950s the concept of composite materials came into being and fibre reinforced concrete was one of the topics of interest. Later, the use of asbestos for concrete reinforcement was discouraged due to the associated health risks. New materials like steel, glass, and synthetic fibres replaced asbestos for reinforcement. Achieve research is still in progress on this important technology, and research into new fiber reinforced concretes continues today.

II.MATERIALS AND TEST METHODS

The following materials were used for preparing the concrete mix.

1. ACC cement of 53 grade.
2. Fine aggregate.
3. Coarse aggregate.
4. Human hair fiber.
5. SP430.
6. Water.

Ordinary Portland cement of 53 grade ACC cement was used in the project. The fine aggregate was natural sand which is freely available and the coarse aggregate having a size of 20mm and 12mm. There are no particular dimensions of the human hair fibers.

Cement:

The crude materials required to make of Portland cement are calcareous materials, for example, limestone or chalk, and argillaceous material like shale or mud. There are two procedures known as wet and dry procedures relying on whether the blending and crushing of crude materials is done in wet or dry condition. The crude materials utilized for the manufacture of cement consist of predominantly of lime, Silica, alumina and iron oxide. These oxides collaborate with each other in the furnace a grate temperature to form more complex compounds.

Fine aggregate:

Fine totals are fundamentally sands won from the land or the marine condition. Fine totals generally comprise of regular sand or pulverized stone with most particles passing through a 4.75mm sieve The fine total utilized in this examination is stream sand which is acquired from nearby organization.

Coarse aggregate:

Coarse totals are particles more prominent than 4.75mm however , the range between 9.5mm to 37.5mm in diameter. They can either be from essential, secondary or reused sources. Fundamental or virgin totals are either land or marine-won.

Human hair fiber:

Human Hair as innovation to the field of Fibre Reinforced Concrete, usage of Human Hair as fibre gained its important. Chemically, about 80% of human hair is formed by a protein known as Keratin, with high grade of fur-coming from the amino acid cysteine - which is characteristic to distinguish it from other proteins. Keratin is laminated complex formed by different structures, which gives the hair strength, flexibility, durability and functionality. Basically, the hair thread has a cylindrical structure, highly organized, formed by inert cells, most of them keratinized and distributed following a very precise and pre-defined design. Hair forms a very rigid structure in the molecular level, which is able to offer the thread both flexibility and mechanical resistance. Human hair has about 65-95% of its weight in proteins, 32% of water, lipid pigments and other components.

Details of Tests: The following tests are performed on concrete blocks reinforced with human hair fiber

- Workability
- Flexural strength

Three beams (150*150*700) for each mix were casted and tested for flexural strength for 3, 7 and 28days. After casting specimens were tested with the machine.

III. TASTING PROCEDURE

3.1Mixing

Mixing process was prepared in two stages by pan mixing. Firstly, cement, fine totals, coarse totals of 20mm and 12mm, Human hair fibre on SSD condition and binder were mixed together in concrete mixer for 2.5 minutes. At the end of this dry mixing, a well- shacked super-plasticizer sp430 and water added in the concrete mixer and the wet mixing was continued for another 3 minutes. To ensure the good homogeneity in the mix fresh concrete was mixed for another 2 minutes. Finally the mix is prepared for casting.

3.2 Curing

The specimens were removed from the moulds after 24 hours of casting and they are put in a water pond until for testing. Some of the specimens were removed from the water after 3, 7 and 28 days of submersion in water for testing the specimens of flexural strength.

3.3 Workability

3.3.1 Slump cone Test

Slump can be summed up as, under the own weight of fresh concrete, vertical settlement of a standard cone of fresh concrete(actually frustum of cone). The cone of concrete in a slump test may sometimes fail in shear, thus casting doubts on the stability of the concrete system. Lack of stability is termed as segregation. Slump cone test values for various mix proportions are as following:

Table3.1: Slump cone test values for different mix proportions.

S.No	Mix Notation	Percentage of Human hair	Slump cone values in cm
1	M1	0%	10.5
2	M2	0.5%	10.1
3	M3	1%	9.4
4	M4	1.5%	8.9

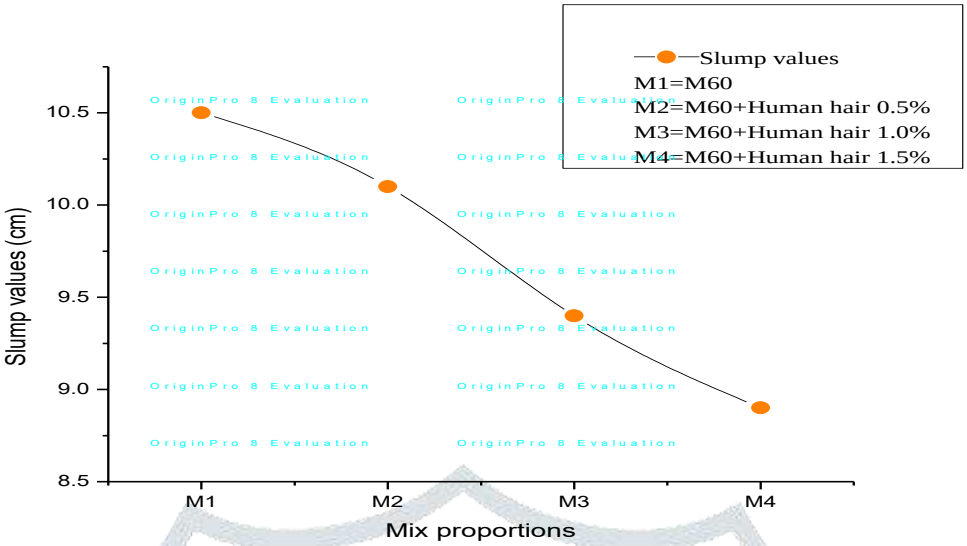

Fig.3.1: slump cone test values for various mix proportions

3.3.2 Compaction Factor Test

Compaction factor is a survey of the density of concrete to which a new mixed concrete can be compacted for a standard contribution of vitality corresponding to the hypothetical greatest density it can have identifying with zero air content. This hypothetical greatest density can be ascertained in the laboratory as that accomplished by loaded with similarity of fresh concrete.

Table3.2: Compaction Factor values For Various Mix proportions

S.NO	Mix Notation	Percentage of Human hair	Compaction Factor values
1	M1	0%	0.94
2	M2	0.5%	0.915
3	M3	1%	0.906
4	M4	1.5%	0.881

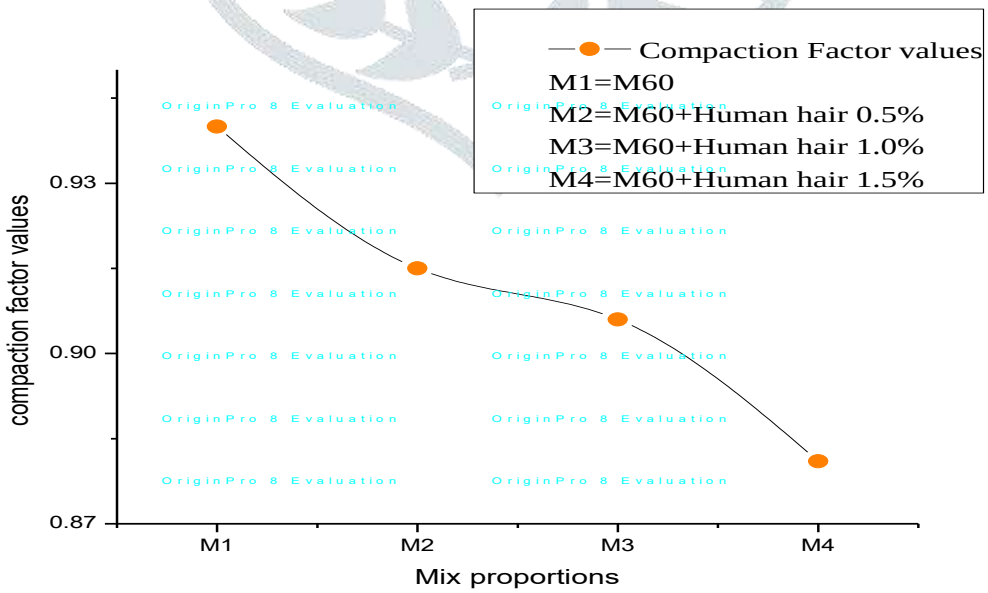

Fig.3.2: Compaction Factor Values For Various Mix Proportions

3.3.3 Vee Bee Test

The Vee bee index is a time period estimate with a standard rate of energy input; the time required to force the fresh concrete to flow to a standardized extent is called the Vee bee time. It is a estimation of the flexibility of the fresh concrete.

Table3.3: Vee Bee Time Values For Various Mix Proportions

S.NO	Mix Notation	Percentage of Human hair	Vee Bee Time in sec
1	M1	0%	8
2	M2	0.5%	10
3	M3	1%	11
4	M4	1.5%	13

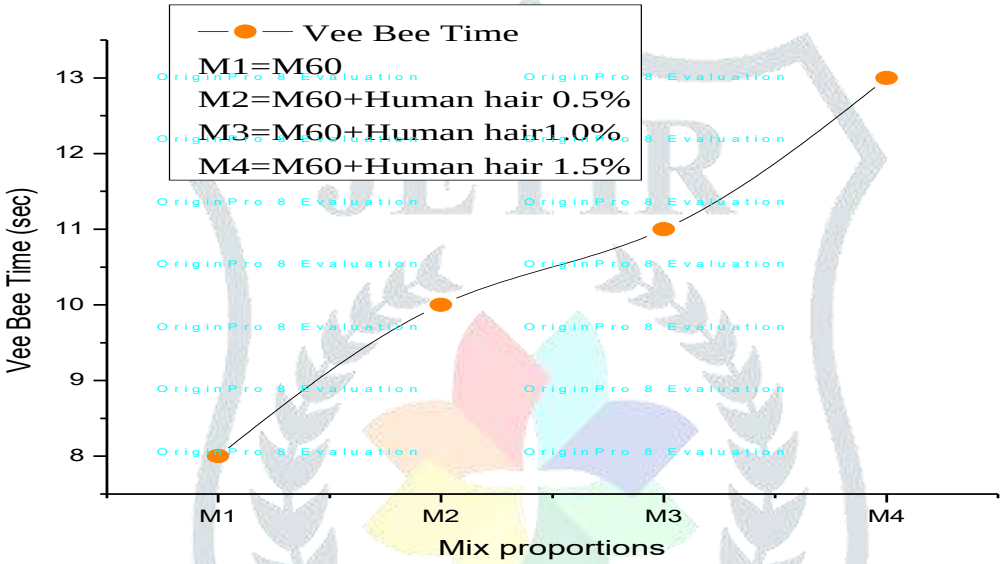

Fig.3.3: Vee Bee Time Values For Various Mix Proportions

IV. RESULTS AND DISCUSSION

4.1 Flexural Strength

Tensile strength of concrete having one of the measure is flexural quality . It is assessed by stacking 6 x 6 inch (150 x 150-mm) solid pillar with a range length something like three times the significance. Flexure strength of concrete is controlled by standard test procedures two-point stacking or center point stacking. Flexural Strength of Concrete is around 10 to 20 percent of Compressive quality in view of the sort, size and volume of coarse total used. In any case, the best relationship for specific materials is gotten by research office tests for given materials and mix design.The sample is checked for its setup longitudinally and adjusted if vital. Know while setting the two stacking focuses are at a similar level. The heap is connected on the example utilizing 15 tones pre-adjusted demonstrating ring at general interims. The heap is transmitted to the component through I - area and two 16mm distance across bars set at 200mm from each help. For each expansion of stacking the diflection at the center and at 1/3 purposes of pillar are recorded utilizing dial guage. Constant perception is fundamental. Before a complete stage the avoidance meters are evacuated and the method of load application is proceeded. As the heap is expanded the parts are augmented and extended to top ultimately the sample crumbled in Flexure. At this stage the heap is recorded as a complete load. Finally use of the above data flexural strength has been computed.

Fig.4.1: Test setup for Flexure strength of beam

The Flexure strength of beam is calculated using the formula:

$F = M/Z$ in N/mm^2

Where M = Bending moment in N.mm

$Z=I/y$= Section modulus in mm^3

f = Flexural strength of beam in N/mm^2

$= WL/bd^2$

W=Ultimate load and L, b and d are section dimensions

Table 4.1: Flexure strength for beams from 3, 7 and 28 days in partial replacement of cement with human hair

S.No	Mix notations	Percentage of Human hair	Flexure strength for beams in Mpa		
			3 days	7days	28 days
1	M0	0%	4.598	5.473	6.129
2	M1	0.5%	5.036	5.9107	7.1136
3	M2	1.0%	5.69	6.57	7.77
4	M3	1.5%	5.911	6.785	8.2073

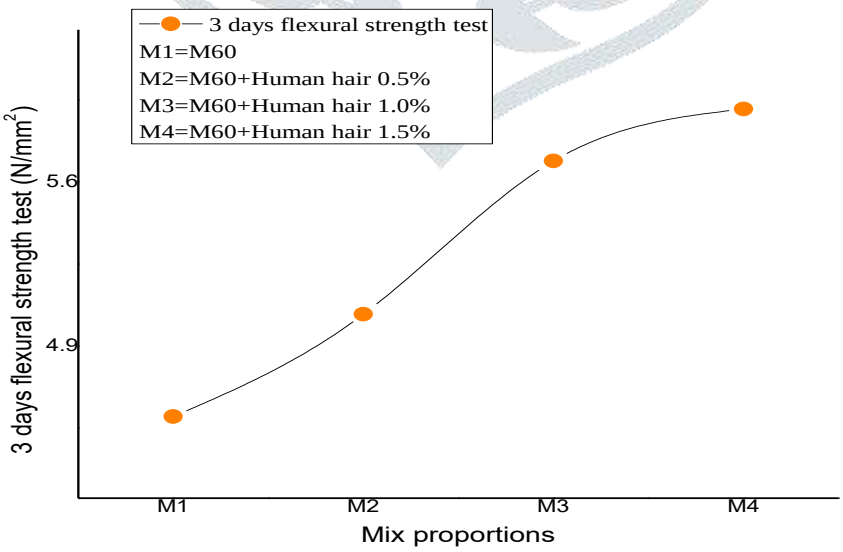

Fig.4.2: Flexural Strength values of various Mix proportions For 3days water curing

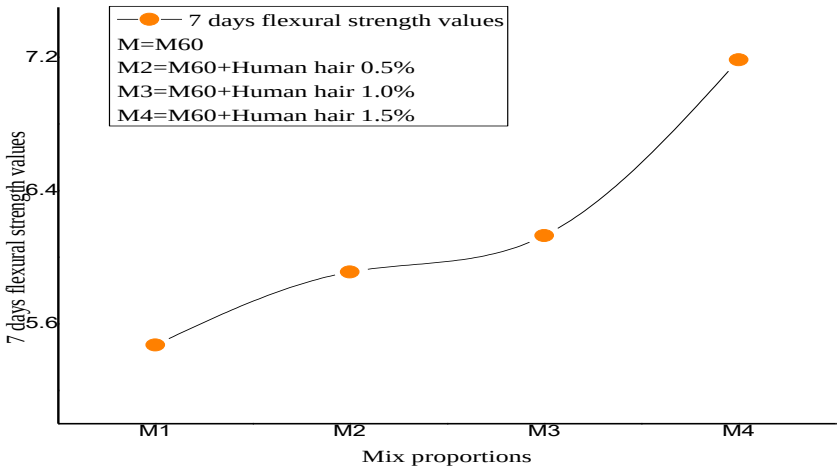

Fig.4.3: Flexural Strength values of various Mix proportions For 7days water curing

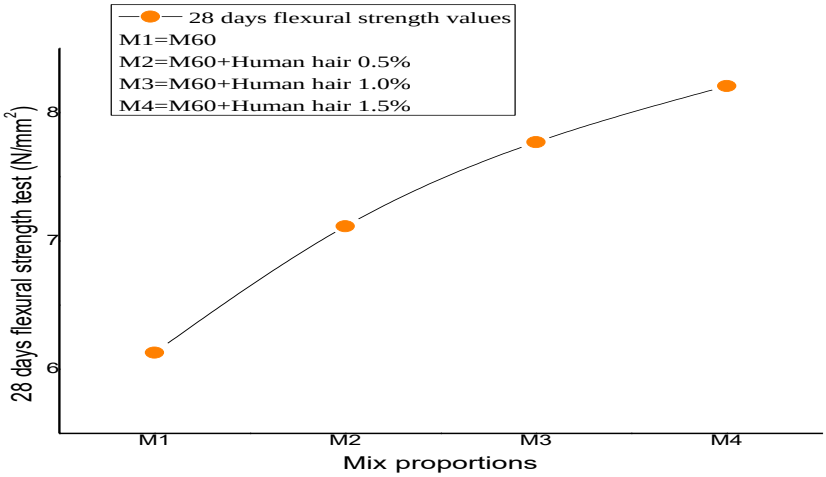

Fig.4.4: Flexural Strength values of various Mix proportions For 28days water curing

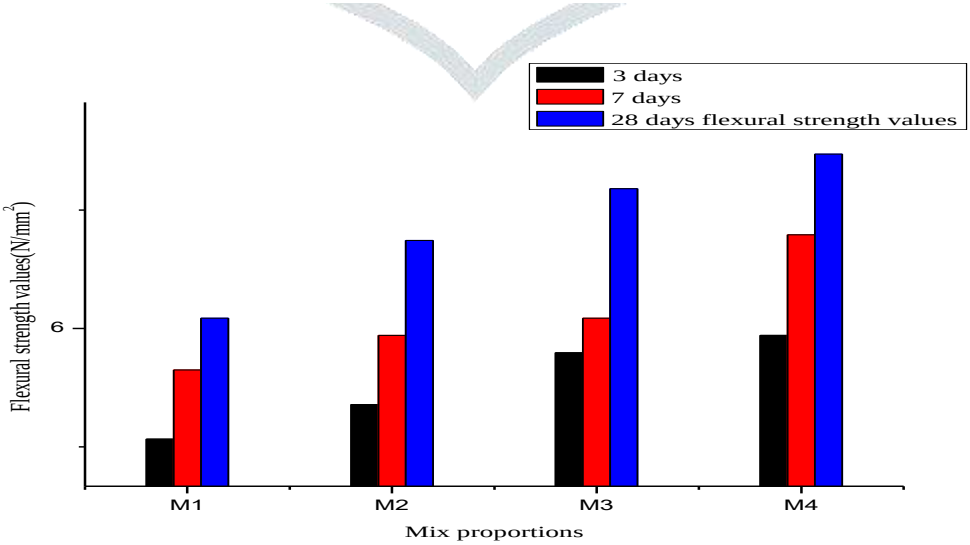

Fig.4.5: Superimposed bar graph for periods of 3,7 and 28 days of Human hair Fiber replacement with cement Vs Flexural strength

From the above observations and graph plotted,we can say that clearly the flexural strength of M60 Concrete increase after addition of admixtures. The optimum point of flexural strength occurs at 1.5% human hair. It is 22% higher than the plain concreteM60(Mix M1).The super imposed graph can also be seen above for further more clarity.

IV. CONCLUSION

- Human hair waste can be effectively managed to be utilized in fibre reinforced concrete constructions.
- According to the test performed it is observed that there is remarkable increment in properties of concrete according to the percentages of hairs by weight of cement in concrete.
- Workability of concrete decreases by the addition of admixture as human hair
- There was an overall increase of 22% in the flexure strength of concrete.
- It is well observed that the maximum increase is noticed in the addition of 1.5 % hair fibre, by weight of concrete, in all the mixes.
- Crack formation and propagation are very much reduced showing that FRC can have its applications in seismic resistant constructions.
- The project may be extended for mixed design M70, M80 etc for different admixtures adding with replacement of cement

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