



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

An Experimental Study of Human Hair in Concrete as Fibre Reinforcement & also used of the plasticizers/super plasticizers.

¹RAGHAV ROSHAN, ²VASEEM, ³MD AFTAB ALAM, ⁴GORAKH KUMAR, ⁵AKASH CHOUDHARY

¹How to increase tensile strength of concrete?, ²Experimental study on the plasticizers with concrete, ³How to increase tensile strength of concrete?, ⁴Advance research on the plasticizer property, ⁵How to increase tensile strength of concrete?

¹COLLEGE OF ENGINEERING & RURAL TECHNOLOGY, MEERUT,

Abstract— Since the traditional times, several researches and advancements were carried to reinforce the physical and mechanical properties of concrete. Fiber concrete is one in all those advancements that offers a convenient, sensible and economical technique for overcoming small cracks and similar sort of deficiencies. Since concrete is weak in tension therefore some measures should be adopted to beat this deficiency. Human hair is usually sturdy in tension; therefore it are often used as a fiber reinforcement material. Human hair Fiber is another non-degradable matter obtainable in abundance and at value|low-cost} cost. It additionally reduces environmental issues. additionally addition of human hair fibers enhances the binding properties, small cracking management, Imparts plasticity and additionally will increase swelling resistance. The experimental findings in our studies would encourage future analysis within the direction for future performance to extending this value of effective sort of fibers to be used in structural applications. Experiments were conducted on concrete cubes, cylinders and beams of normal sizes with addition of assorted percentages of human hair fiber i.e., 0%, 0.5%, 1% and 1.5% by weight of cement, fine & coarse combination and results were compared with those of plain cement concrete of M-20 grade. for every share of human hair other in concrete, four cubes, 3 cylinders and 3 beams were tested for his or her various mechanical properties at natural action periods of three, seven and twenty eight days. Optimum hair fiber content was obtained as one.5% by weight of cement. Superplasticizers (SP's), additionally referred to as high vary water reducers, area unit additives employed in creating high strength concrete. Plasticizers area unit chemical compounds that modify the assembly of concrete with ca. 15 August 1945 less water content. Superplasticizers enable reduction in water content by half-hour or additional. segregation & harm are also arised due to excess water content.so decreased the water content scale back the probabilities of hairs assortment in one place.

Keywords:-Concrete,fiber reinforcement,Human hair,plasticisers/superplasticizers.

INTRODUCTION:-

Fiber concrete (FRC) is concrete containing fibrous material that will increase as structural and is gaining importance. It contains short separate fibers that area unit uniformly distributed and indiscriminately bound. The conception of victimisation fibers as reinforcement isn't new. Fibers are used as bolstered since precedent days. traditionally, horsehair was employed in mortar and straw in mud bricks. within the early decade, amphibole fibers were employed in concrete, and within the Fifties the conception of composite materials came into being and fiber concrete was one in every of the topics of interest. Later, the utilization of amphibole for concrete reinforcement was discouraged thanks to the associated health risks. New materials like steel, glass, and artificial fibers replaced amphibole for

reinforcement. A fiber could be a tiny piece of reinforcing material possessing bound characteristics properties. Addition of fibers to concrete influences its mechanical properties that considerably depend upon the sort, length and share of fiber. Generally, concrete is weak in tension and incorporates a brittle character. therefore fibers area unit value-added to extend its strength and improve the characteristics of construction materials. Fibers area unit typically employed in concrete for the subsequent reasons:- 1) to regulate cracking thanks to each plastic shrinkage and drying shrinkage. 2) They conjointly cut back the porosity of concrete and therefore cut back injury of water. 3) They manufacture bigger impact, ductility, strength, abrasion and shatter resistance in concrete. 4) The fineness of the fibers permits them to bolster the mortar fraction of the concrete, delaying crack formation and propagation. This fineness conjointly inhibits injury within the concrete, thereby reducing porosity and rising the surface characteristics of the hardened surface. however use of upper share of fiber is probably going to cause segregation and harshness of concrete and mortar. The fiber is usually delineated by a convenient parameter known as ratio. The quantitative relation|ratio} of the fiber is that the ratio of its length to its diameter. Its worth varies for various fibers. concrete with high ratio was found to possess improved effectiveness. The modulus of snap of matrix should be abundant not up to robust fiber for economical stress transfer. The surface bond between the matrix {and the|and therefore the|and conjointly the} fiber also verify the effectiveness of stress transfer, from the matrix to the fiber. a decent bond is crucial for rising strength of composite. Basically, the hair thread incorporates a cylindrical structure, extremely organized, fashioned by inert cells, most of them keratinized and distributed following a awfully precise and pre-defined style. Hair forms a awfully rigid structure within the molecular level, that is ready to supply the thread each versatile and mechanical resistance. Human hair has regarding 65-95% of its weight in proteins, thirty second of water, macromolecule pigments and different elements Why human hair a fiber?

II. LITERATURE REVIEW

This chapter gifts the background data on the problems to the to be contemplate within the present analysis work and to focus the importance of this study. Dr. Sinan abdukhaleq yaseen, University of salahaddin printed a paper on "An Experimental Investigation into the mechanical properties of latest natural fibre strengthened Mortar" in 2013. This paper highlights use of human hair fiber (HHF) as strengthened material in building material material. Tests were carried to review the influence of fiber content on the compressive strength, rending lastingness, flexural strength and cargo deflection was conferred for 2 w/c ratios (0.6 and 0.7). Energy absorption capability and malleability issue were improved significantly with the fiber content increased , that makes victimization the HHF appropriate for seismic force resistant structures. Jain.D and Kothari.A, it's determined that there's exceptional increment in properties of concrete consistent with the chances of hairs by weight of in concrete. once M20 concrete with I Chronicles hair is compared with the plain cement concrete, it's found that there's a rise of 100 percent in compressive strength and three.2% in flexural strength. once M20 concrete with one.5% hair is compared with plain cement concrete, it's found that there's a rise of twenty-two in compressive strength and eight.6% in flexural strength. once M20 concrete with I Chronicles hair is compared with the plain cement concrete, it's found that there's no increase in compressive strength and a pair of in flexural strength. once M20 concrete with one.5 relax is compared with the plain cement concrete, it's found that there's a rise of eight.8 % in compressive strength and five.5 you bored with flexural strength. once M25 concrete with I Chronicles hair is compared with the plain cement concrete, it's found that there's a rise four.6% in compressive strength and three in flexural strength. once M25 concrete with one.5% hair is compared with the plain cement concrete, it's found that there's a rise of St Martin's Day in compressive strength and four-dimensional in flexural strength.

Nila V. M, Raijan K. J, Susmitha Mark Anthony, Riya baboo M, Neena Rose Davis, in keeping with the take a look at performed it's ascertained that there's exceptional increment in properties of concrete in keeping with the odds of hairs by weight of concrete. There was AN overall increase of one – twelve-tone system within the compressive strength of concrete and up to five within the flexural strength of concrete take a look at specimens by the addition of hair fibers in numerous quantities. it's well ascertained that the most increase is detected within the addition of

twenty-two hair fiber, by weight of concrete, all told the mixes. it's concrete mixes, creating the hair fiber ferroconcrete best appropriate to u the applications with those concrete mixes. Crack formation and propagation ar significantly reduced showing that FRC will have its applications in unstable resistant constructions. Yadollah Batebi, Alireza Mirzagoltabar, Seyed Mostafa Shabaniyan and Sara Fateri, Department of applied science, Babol University of Technology. primarily most of cement primarily based mixtures ar doubtless shrinking. Use of fibers isn't a brand new plan during this case. Previously, there have been evidences that horse hair, straw and cotton fibers were employed in mud and mortars in precedent days. Then, utilizing these fibers in concrete mixtures could will increase concrete workability and reduces cracks. because of nano cross-sectional of hair and its correct lastingness this project investigates its application to cut back the shrinkage of concrete mixtures. For this purpose, human hair fibers were employed in zero.4 and 0.8 and 1.2 weight proportion and also the length of the fibers in every case varied between fifteen and sixty millimeters. Results ar shown as respectable quantity of hair could scale back within the shrinkage within the hair ferroconcrete.

III. METHODOLOGY

In this study mixes, we tend to square measure planned to form with fiber with variable proportion of zero.5%, 1% and 1.5%.Control combine was dotted 0%fiber.

A. assortment of Raw Materials

materials utilized in this study are: standard cement (OPC): 53grade ACC Cement Human hair fiber: Human hair fiber collected from the saloon look within the Visakhapatnam district. These fibers square measure cracked into three.5cm length and washed these fibers within the dimethyl ketone for laundry or sharpening functions.

- 1) Water Collected from the native H₂O sources
- 2) Fine combination River sand passing through four.75mm sieve size
- 3) Coarse combination Aggregate sizes of 20mm
- 4) Basic take a look at Results of Materials For all the materials utilized in the project following basic tests were conducted in keeping with the IS specifications.

B. Basic take a look at Results for Cement

- fineness of cement=7.16%
- relative density of cement=3.195
- traditional consistency of cement=31.5%
- Penetration depth for initial setting time=5mm
- Penetration depth for decoration setting time=32mm

C. Basic take a look at Results for Fine combination

- Sieve analysis for fine aggregate=zone-1
- relative density of fine aggregate=2.519
- Water absorption for fine aggregate=0.2

D. Basic take a look at Results for Coarse combination

- Sieve analysis for coarse aggregate=table two of IS 383- 1970
- relative density for coarse aggregate=2.707
- Water absorption for coarse aggregate=1.68

IV. EXPERIMENTAL WORK

- A. Mixes Four mixes square measure planned by cement content with human hair in percentages of zero, 0.5, 1, 1.5 by weight of cement material was incorporated all told the mixes. Plain concrete within which third human hair fiber was taken as management combine. for every combine 3Cubes of 150x150x150mm size three|and three}Cylinders of 150mm Defense Intelligence Agency and 300mm length and 3 beams of 700mm x150mm x150 Grade were casted.

Mix proportions(M20 Grade) As per IS 10262-2009)

Material	Water	Cement	Fine Aggregates	Coarse Aggregates
In kg/m ³	186	294	724.888	1169.640
Ratio	0.5	1	2.466	3.978

Mix proportions for human hair fiber ferroconcrete intermingled with concrete (M20grade): Taking management combine proportions as reference, combine proportions for alternative mixes were calculated. Here, the combination proportions for the combination within which and zero.5% fiber was incorporated square measure given below.

Material	Water	Cement	Fine Aggregates	Coarse Aggregates	In kg/m ³	186
294	724.888	1173.946	Ratio	0.5	1	2.466
3.992						

Casting the specimens taking the management combine style (i.e. third fiber) as reference weights of materials square measure calculated as shown on top of. all told the concrete mixes human hair fiber was varied within the percentages of zero.5%, 1.0%, 1.5%, by the load of cement material content was incorporated for the w/b quantitative relation zero.5. Total sixteen Cubes (150x150x150mm), 12Cylinders (150mm Defense Intelligence Agency and 300mm length) and 12beams (700mmx150mmx150mm) for all the 4mixes as well as management combine.

Mix 1: third fiber

Mix 2: 0.5% fiber

Mix 3: 1.0% fiber

Mix 4: 1.5% fiber

B. Workability

To determine workability of contemporary concrete the subsequent tests were conducted.

- 1) Slump cone check
- 2) Compaction issue check

C. Tests

To know the hardening properties of concrete the subsequent tests square measure conducted on the specimens for three, seven and twenty eight days from time of blending the water to the dry materials 1)

- 1) Compressive strength check (Cubes)
- 2) Split lastingsness check (Cylinders)
- 3) Flexural strength check (beams)

V. RESULTS

A. Workability

Workability of human hair fiber ferroconcrete is diminished than the management combine, thanks to the presence of human hair fiber. The results of workability square measure shown within the following Table-1.

S.No.	Mix No.	Slump price (cm)	Compaction factor	1
Mix 1	5	0.9	2	Mix 2
6		0.92	3	Mix 3
0.93	4		4	6
0.95				

Table 1: Results of Workability of Mixes

B. Compressive Strength The compressive strength of concrete is set by testing the cubes beneath compressive testing machine. The results of compressive strength square measure shown within the Table-2. most compressive strength occurred at (1.5%fiber) and it's nearer to the target strength.

S.No.	For Days	Compressive strength in N/mm ²			
		Mix 1	Mix 2	Mix 3	Mix 4
1	3	6.36	6.61	7.01	7.15
2	7	12.42	12.64	13.12	13.46
3	28	24.32	24.65	25.31	25.63

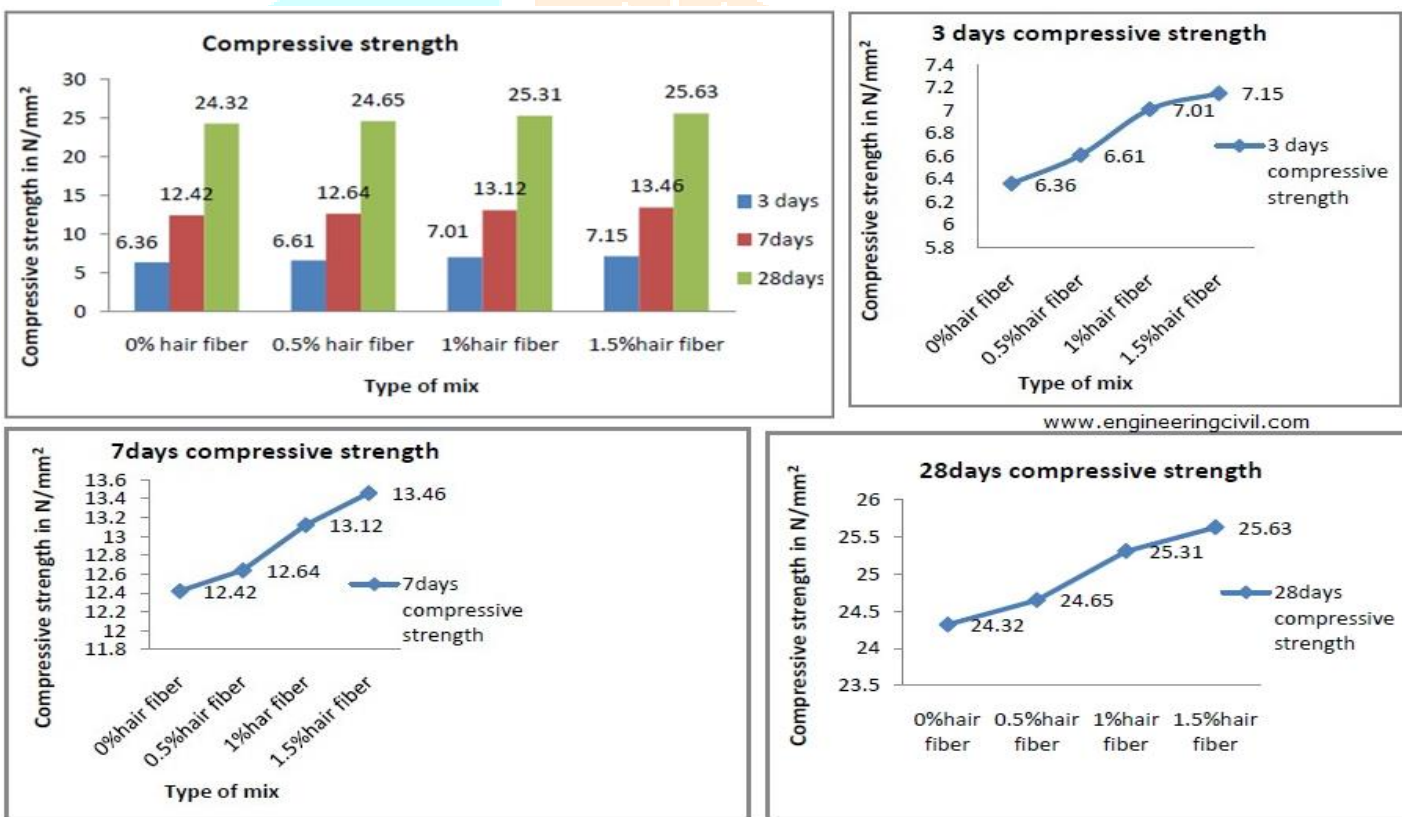


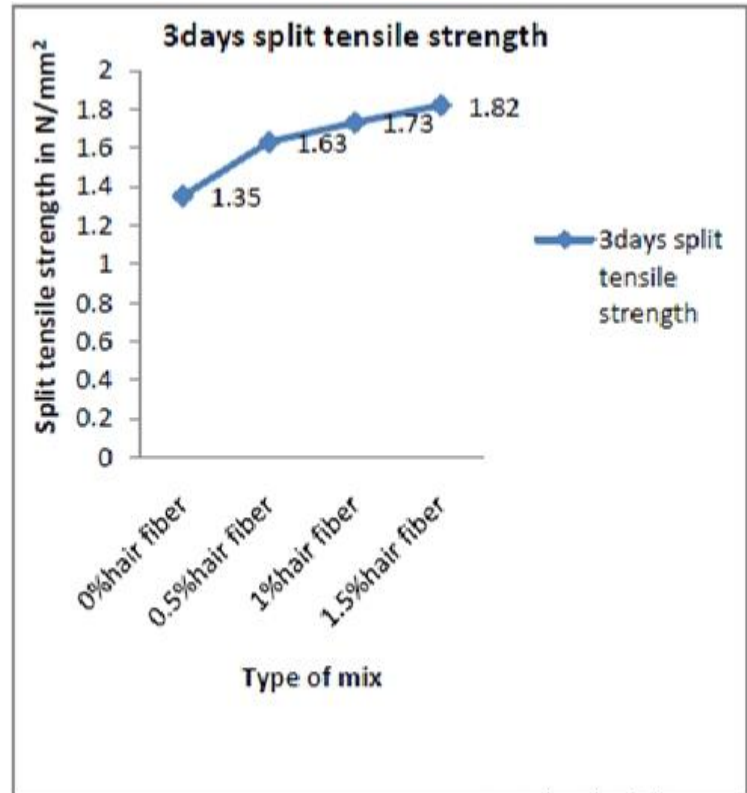
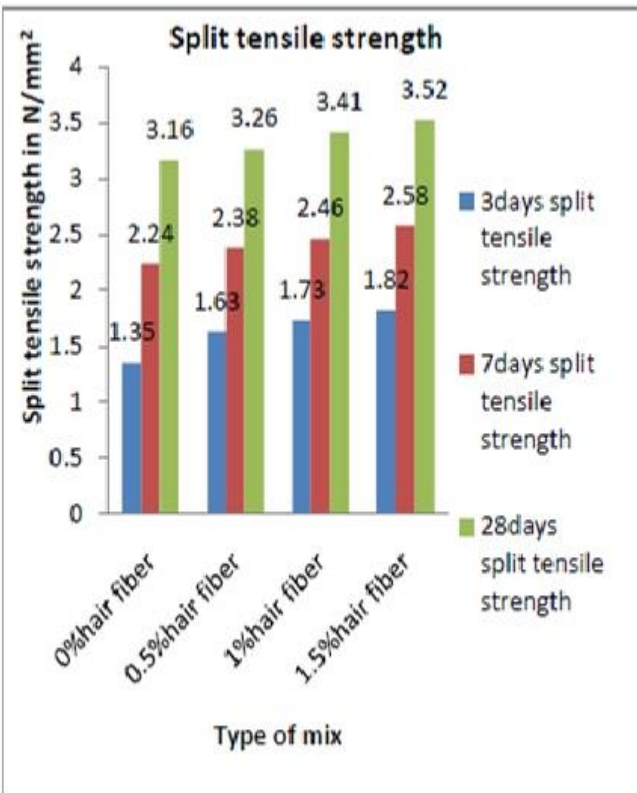
Table 2: Results of Compressive Strength

Fig. 4: Variation of Hair Fiber Content v/s Compressive Strength at three, seven and twenty eight Days Split strength Split strength take a look at was conducted for the cylinders of 150mm United States intelligence agency and 300mm length. The obtained values area unit tabulated in Table-3.Compared to traditional concrete crack dimension is for this fiber concrete. ripping of specimens into 2 items is controlled utterly with this fiber.

S.No.	For Days	Compressive strength in N/mm ²			
		Mix 1	mix 2	Mix 3	Mix 4
1	3	1.35	1.63	1.73	1.82
2	7	2.24	2.38	2.46	2.58
3.	28	3.16	3.26	3.41	3.52

Table 3: Results of Split Tensile Strength





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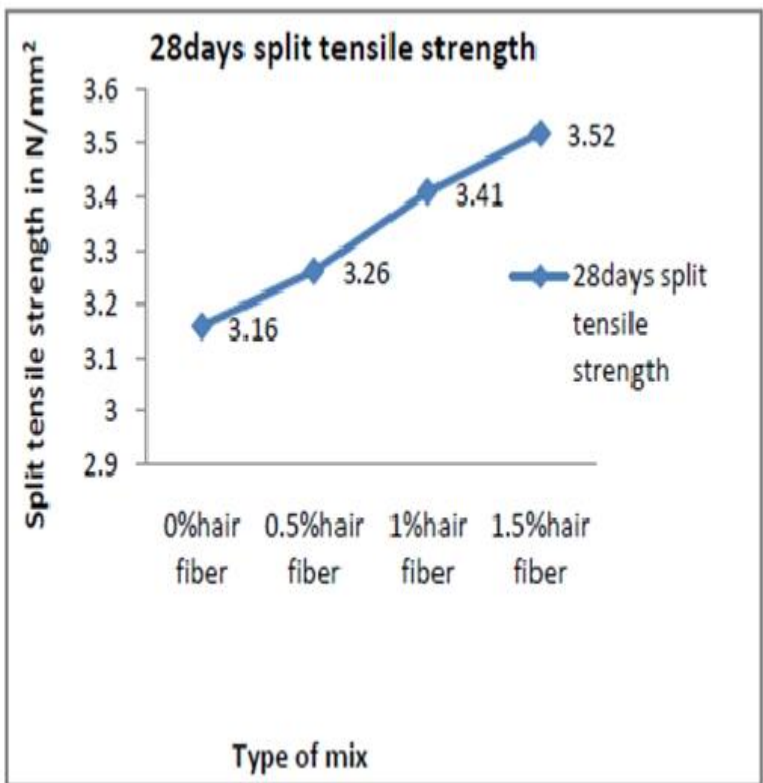
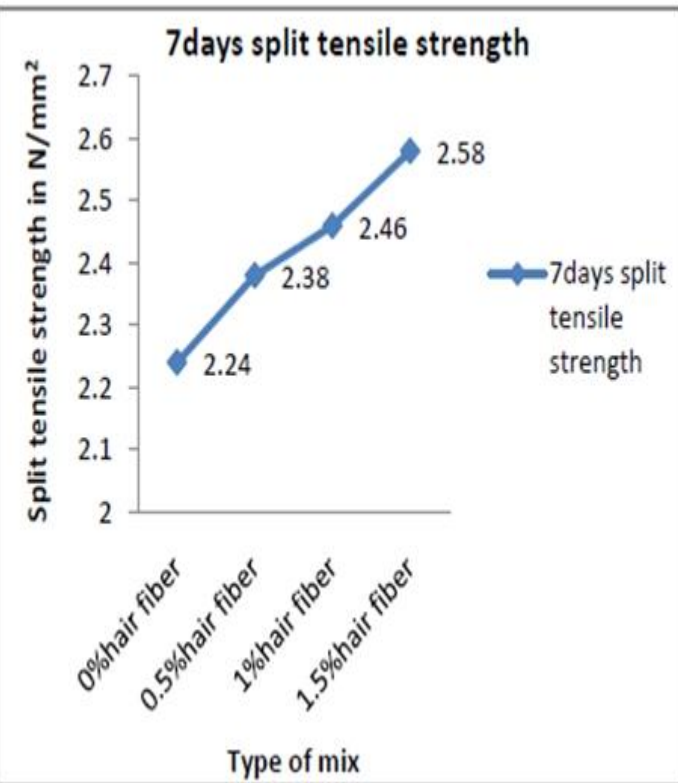
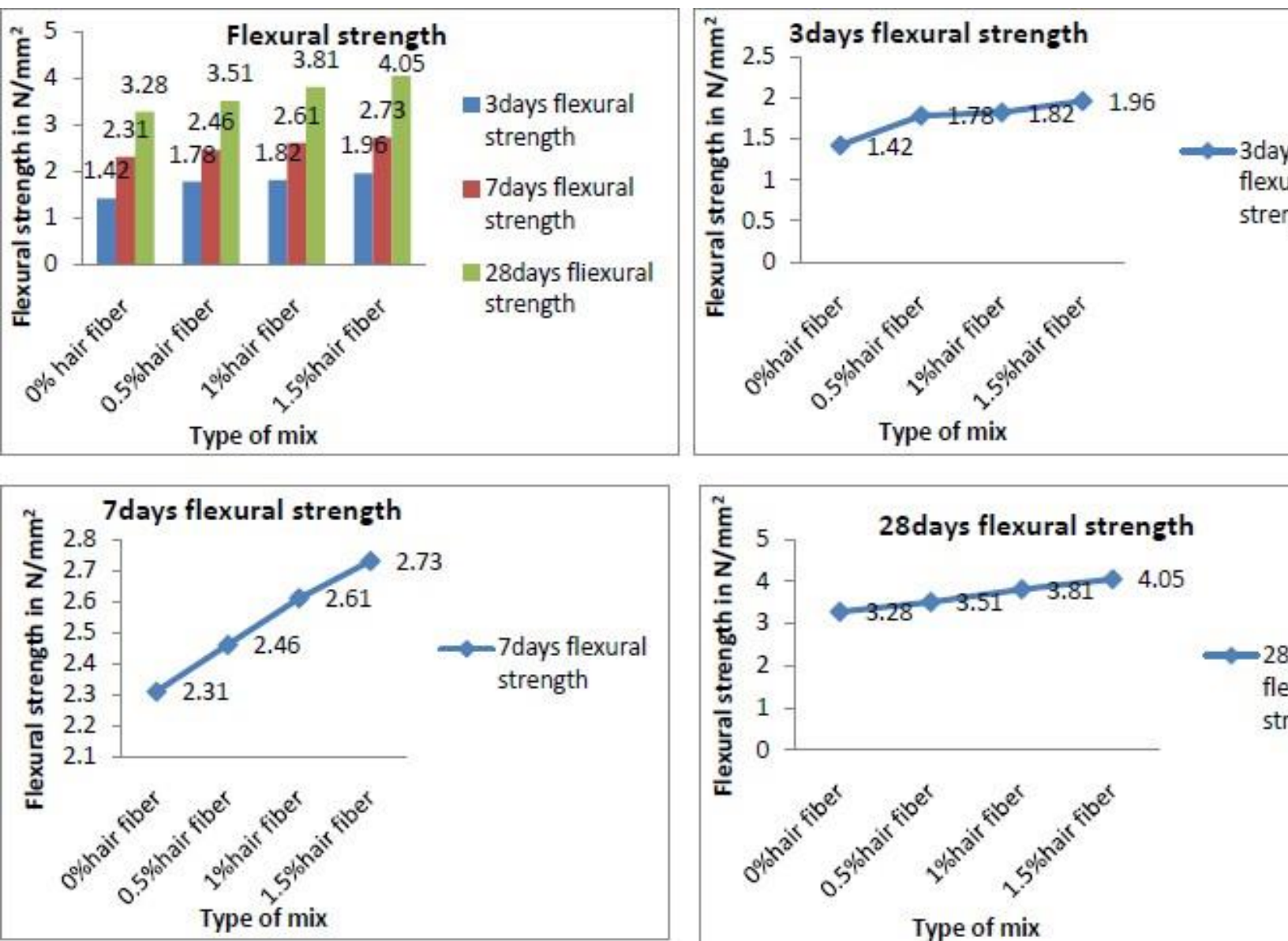


Table 4: Results of Flexural Strength



Variation of Hair Fiber Content v/s Flexural Strength at 3, 7 and 28 Days

CONCLUSION

- Human hair waste can be effectively managed to be utilized in fiber 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.
- The human hair fiber concrete has the high compressive strength compared to the normal Concrete.
- Better split tensile strength was achieved with the addition of the human hair in concrete. The strength has increased. When compared to that of the conventional concrete specimen.
- It is well observed that the maximum increase is noticed in the addition of 1.5 % hair fiber, 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 addition of human hairs to the concrete not only modifies various properties of concrete like tensile strength, compressive strength but also enhances the binding properties, micro cracking control and also increases spalling resistance. The crack width is reduced to a greater extent.

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