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## Analysis of concrete with using human hair as fiber-reinforced

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### ABSTRACT

*Human hair is a waste material that is found in the bountiful sum in the day by day life. It is a typical constituent in city squander streams and causes ecological issues as it is a non-degradable waste. Fiber strengthened cement gives great flexure strength less brake improvement. Since concrete is frail in strain thus a few estimates should be embraced to defeat this insufficiency. Human hair is by and large solid in strain; henceforth it very well may be utilized as a fiber fortification material. Human hair Fiber is a choice non-degradable issue available in riches and at unassuming cost. Hair additionally diminishes ecological issues. Likewise, expansion of human hair strands upgrades the coupling properties, miniature breaking control, Imparts ductility, strength and furthermore builds expanding opposition. The exploratory discoveries in our investigations would support future examination toward the path for long haul execution to expanding this expense of powerful kind of strands for use in primary applications. The examination was led on solid 3D shapes, chambers, and light emissions size with expansion of different rates of human hair fiber i.e., 0%,0.5% 1%,1.25%,1.5%, and 2% by weight of concrete, fine and coarse aggregate, and results were contrasted and those of plain concrete cement of mid-range grade. For every level of human hair included solid, we make a different cubes sample that was tried for their individual mechanical properties at relieving times of 7days, 14days, and 28days. The ideal amount of human hair was gotten as 2% by the weight of concrete. That investigation encourages the fresher to comprehend the human hair fiber fortified execution in concrete cement.*

**Keywords:** Workability, Environmental Problems, Economical and Compressive Strength, Slump Value

### 1. INTRODUCTION

Concrete is mostly used material in construction industry. Concrete has enough strength in compression but weak in tension. As compare to tensile strength of concrete to compressive strength, it is around 10 percent of compressive strength hence it should be reinforced either with steel or different types of fibers for increasing the tensile strength of concrete. Different types of fibre used in concrete. There are additional chance to use completely different material as fibers in concrete, human hair being one in every of them and thought of as a waste Human hairs collection causes a few natural issues; be that as it may, it very well may be conjointly utilized as fiber in cement. Fuse of human hairs to the solid improves solid properties, for example, compressive strength, restricting properties, little breaking the board alongwith obstruction from spalling at fortification and solid bond. Accordingly, human hairs which are in relative plenitude in nature and are non-degradable, gives great alternative in fiber fortified cement. A retardant of non-uniform dissemination of hairs is visaged though exploitation them as filaments anyway it likewise can be settled by Electro-statically charging them. Hair acts like all elective fiber, and have a few advantages. Its high strength makes it satisfactory to utilize a copper wire with comparative breadth. Hair being a non-degradable issue is making partner degree ecological disadvantage in this manner its utilization as a fiber fortifying material would limit the issue. It is in bounty and at an extremely low cost. It fortifies the mortar and keeps it from spalling. Fake strands are synthetic filaments in which essential substance units made by compound blend. Normal strands are named hair like material which is acquired from trimming creature hair and plants. Manufactured strands can be created at low cast and in immense amount when contrasted with characteristic filaments. Normal strands can give a few advantages for attire, for example comfort and over their engineered partners and furthermore utilized for underlying applications, yet the generally with manufactured thermoset grid material that gives some natural advantages. The examination about human hair waste and its use was assessed by Gupta. Gupta saw that the employments of human hair in the huge number of zones which including agrarian, medication and mechanical [2]. Strands which are generally utilized in development industry are steel filaments, glass strands, engineered strands and normal filaments. Filaments having short length are blended in plain cement for improving its fragile conduct and conferring the flexibility. This new kind of cement having short discrete filaments spread toward all path is alluded as fiber strengthened cement (FRC). Strands can be diminished penetrability of concrete just as seeping of water. Filaments interlink and capture around the total particles and blending that liable for low functionality. Human hair is solid in pressure with the goal that it utilized as fiber strengthened material. As plain cement is feeble in pressure, hence, number of methods are being created to defeat

this inadequacy. Moreover, these strategies incorporates utilizing changed materials like normal fiber for example creature hair, human hair and so on which can increment pliable conduct and gives in flexural conduct of cement. Economical cement includes utilization of such materials which satisfy both requirements for example improve strength and material ought to be accessible in neighborhood market at reasonable sum. This is the explanation hair are utilized in this examination as fiber. Hairs are considered as waste and result in the vast majority of the societies and are unloaded in outdoors. Some place these dumps are left transparently for its degraation, at different spots hair burnet openly which creats natural contamination by making poisonous gases. To save the climate from its debasement by using the waste stuff (human hair) and to improve the pliable behaviour of cement are the primary targets of this exploration.

In this current paper the test study, human hair strands are Incorporated into concrete at substance of 0, 0.5, 1, 1.25, 1.5 and 2% by weight of concrete. Most extreme human hair filaments are joined into cement of 2% by weight of concrete. 3D shapes, radiates and round and hollow examples are casted and relieved appropriately for assessing different mechanical properties. These examples made of human hair fiber strengthened cement are tried at 7, 14 and 28days and the change in mechanical properties when contrasted with plain concrete cement is noticed.

**2. MATERIAL USED**

Ordinary portland concrete of grade43 with starting setting time of 30minutes and last setting time of 460minutes utilized. Sand used as a fine aggregate which passing through 2.36mm IS sieve is taken. 20mm angular shape coarse aggregate are used. Locally available human hair are used in the analysis. It is collected from Barabanki salon. Water is generally used for mixing and curing of concrete.

**Table 1: Properties of human hair**

Properties	Value
Length of hair fibre	12 to 65mm
Diameter of hair	80 to110 µm
Aspect ratio	110 to 680
Tensile Strength	290 N/mm2
Strain	45%
Specific gravity	2.57

**3. METHODOLOGY**

This study is taken with the objective of studying and analyzing the impact on concrete of hair fibre on the basis of strength and workability to regulate cracks also on curb the environmental problems being non-biodegradable in nature. The study has been carried in the Concrete technology laboratory of Civil Engg Department of Shri Ramswaroop Memorial Group of College, lucknow (Uttar Pradesh), India. The main working rule behind this current study has been to match the cubes of normal plain cement concrete with cubes of concrete having human hair as fibre on the basis of compressive strength test, as it is known to be the mostly used test due to its ease of performing and also because all the required traits of a concrete are somehow related to the compressive strength test. For carrying out this experimentation concrete cubes of size (15cm x 15cm x 15cm) were created having grades M20 for plain cement concrete and for fibre reinforced concrete using human hairs. A set 3 cubes was prepared and was tested after a curing for 7, 14 and 28 days. For preparing the concrete cubes having human hair as a fibre, hairs were utilized in varying percentage by weight of cement replacing the quantity of cement. The hairs which are used for preparing the specimen concrete cubes were collected from beauty salons then were segregated from the opposite waste and were finally washed with water followed by proper drying under the sun. After that the dried and clean hairs were further segregated based on the length, color and texture of hairs so as to have a uniform distribution of hairs in concrete. The main consideration within the entire experimentation was to combine the dry materials properly before adding any amount of water so on make an efficient mix design. The hairs were weighed by using sensitive weighing machine. After adding water and mixing properly the moulds were kept on a vibrating table to initiate vibrations and to make sure that placing of concrete in the mould is done properly layer by layer so as to avoid any voids or air gaps between the aggregates and the binding material and to have a proper placing of concrete till it is completely filled so on reduce any entry of air bubbles or voids inside the concrete cubes. Finally the moulds were removed from the vibration plate and were kept within the lab with none disturbance for next 24 hours. After that the moulds were removed and the cubes were put into the water tank for different curing durations of 7, 14 and 28days. Finally the cubes were tested on a compression testing machine for analyzing the compressive strength of the cubes. This test was done on both types of specimen cubes i.e., plain cement concrete and the fibre reinforced concrete using human hairs so sas to see the difference between their respective strengths.

**4. RESULTS AND DISCUSSION**

**4.1 Workability Test**

Workability test is done by the two different test, first is slump cone test and other is compaction factor test. Workability of plain concrete is more than a human hair reinforced concrete because fibres entrap the mixutre.

**Table-2: Slump test for workability**

S no.	Percent of hair mix	Slump Value (MM)
1	0	23
2	0.5	24
3	1	24

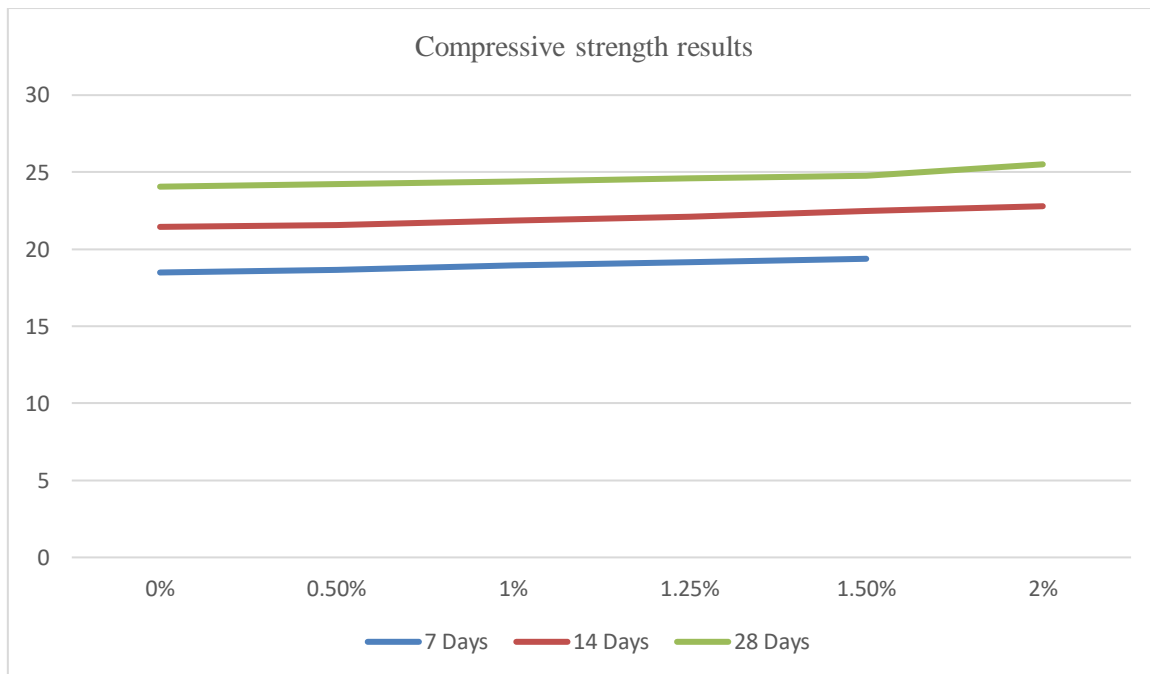
4	1.25	25
5	1.5	26
6	2	26

#### 4.2 Compressive Test

In this test we carried out a cubical specimen of size 15cmx15cmx15cm. Samples were set on the level plate of pressure testing machine. A uniform pace of stacking was applied till the disappointment of the block. The most extreme burden before disappointment is noted and that is the compressive strength of sample.

**Table 3: Compressive strength results**

Percent of hair mix	Average Compressive Strength 7days (N/mm <sup>2</sup> )	Average Compressive Strength 14days (N/mm <sup>2</sup> )	Average Compressive Strength 28days (N/mm <sup>2</sup> )
0%	18.49	21.45	24.06
0.5%	18.67	21.55	24.23
1%	18.93	21.85	24.41
1.25%	19.16	22.09	24.59
1.5%	19.38	22.48	24.76
2%	19.78	22.79	25.51



#### 5. CONCLUSION

Human hair waste is used in concrete of different percentage by weight of cement in concrete. Some important test were performed on cube that is made by the help of hair fibre reinforced. Out of five sample of hair reinforced concrete, namely 0%,0.5%,1%,1.25% and 2%, the optimum percent of hair mix of the weight of cement is to be 2% for peak value of compressive strength. Adding 2% of hair fibre by weight of cement the compressive strength was increased by 6.03 % at 28days. The workability of hair reinforced concrete is decreasing with the using human hair as a fibre. It is entrap the concrete and restrict the flow of concrete that cause low workability. Because the improvement of strength of sample by using human hair as a reinforced fibre. The strength of structure increase . Therefore, Human hair reinforced fibre used it is easily available and it is economical and also its uses in concrete, decreased the environmental problem which occure due to hair waste.

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