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Compressive Strength of Concrete Reinforced with Human Hair

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ABSTRACT
Use of human hair in mortar and concrete is very recent now a days. Human hair is used as natural fiber to enhance the strength characteristic of concrete and mortar. Use of human hair in concrete not only reduces the waste disposal problem but also, it contributes to the economic system by providing an economic construction material. Human hair has advantage that it is completely biodegradable, renewable and easily available at negligible cost. Many studies have been conducted to know human hair concrete performance. In this paper an effort has been made to produce concrete for grade M40 with 0%, 4%, 8%, 12% and 16% hair content and find optimum % of hair content. This study helps the beginner to understand the human hair concrete performance in cement concrete as compared to conventional concrete. Investigation shows that concrete reinforced with human hair content shows more compressive strength as compared to control concrete.

***Keywords*-**Compressive strength, human hair, cement, concrete, mortar.

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I. INTRODUCTION

Reuse of recycled or waste materials for the construction of civil structures is an issue of great importance in this century. Addition of waste products in Fibre-reinforced concrete is also very common now days. Fibre-reinforced concrete is concrete containing fibrous material which increases its structural integrity. It contains short discrete fibres that are uniformly distributed and randomly oriented.

Fibres are usually used in concrete to control cracking due to plastic shrinkage and to drying shrinkage. They also reduce the permeability of concrete and thus reduce bleeding of water. Some types of fibres produce greater impact, abrasion and shatter–resistance in concrete. Some commonly used fibres are Steel, Glass, Carbon, Cellulose, Synthetic fibres like Polypropylene, Nylon and Natural fibres like Coir, Hay etc.

Recently there has been a rapid growth in research and innovation in the natural fibre composite (NFC) area [1]. It is widely recognized that use of natural fibers when used correctly in concrete has many advantages. In similar way when human hair used in correct proportion and mannerit could be ideal choice among other natural fibres.

Gautami et al. [3] conducted study on concrete reinforced with human hair. A detailed parametric test series were conducted in the laboratory. Concrete cube beam and cylinder specimen of standard sizes of M40 grade were prepared. Six cube, three beams and three cylinder specimens were casted with various percentages (1%, 1.5 %, 2%, 2.5% and 3%) of human hair by weight of cement. Specimens were tested at curing period of 7 days, 14 days and 28 days respectively. Author reported optimum hair content 1.5 % (by weight of cement) and addition of human hair imparts binding properties and better resistance against cracking.

Ankaiah [4] et.al. Conducted experiment to study the effect the human hair fibre for concrete grade M20 and M25. Concrete cube specimens were conduct in the laboratory with variable hair fibre content (1%,1.5%,2%,2.5%,3% and 3.5%) by wt. of cement. Results were compared with conventional concrete. Study shows significant increase in strength up to 3%. Beyond 3% addition of fibre content results in decrease in strength.

J. N Akhtara et.al. [5] conducted study to know the effect of human hair fibre on mechanical properties of fly ash hollow block for low height masonry structure .Parametric study was done with variable value of human hair. Author reported increase in compression strength and poissions ratio at hair fibre content 0% to 2%. At 2.5 % hair content there was decreased in compression strength and poission ratio.

Jain D et. al. [6] investigated effect of human hair on flexural strength and compression strength of M20 grade of concrete. Specimens were casted and results were compared with plain

concrete. At 2% hair content author reported remarkable increase in compression strength (8.8%) and in flexural strength (5.5%)

Batebi et. al. [7] investigated effect on shrinkage properties when nano hair is used as fibre in concrete. Addition of fibres results in increase in workability and decrease in shrinkage cracks. Author used nano hair of length ranges from 15 mm to 60mm. percentage of human hair content were 0.4%, 0.8% and 1.2%. Results indicated considerable amount of reduction in shrinkage of the human hair concrete.

Nila VM et.al. [8] investigated effect of addition of human hair as fibre in concrete on compressive and flexural strength. Study shows 1to 12 % increase in compressive strength and 5% in flexural strength. Maximum increment in strength is achieved at 2% hair fibre content.

II. OBJECTIVE OF THE STUDY

The research was aimed to investigate effect of compressive strength of concrete reinforced with human hair.

III. MATERIALS AND THEIR PROPERTIES

3.1 Cement OPC 53 grade cement of Ultra tech was used for this research program.

3.2 Natural Sand. Narmada sand (zone-II) was used

3.3 Aggregate A combination of 20mm nominal size aggregate and 10mm nominal size aggregate is used as coarse aggregate in this experimental program.

3.4 Water The water used was ordinary tap water from the Bhopal city.

3.5 Human hair. Human hair in various proportions were used in this study.

IV. EXPERIMENTAL PROGRAM

To conduct experimental program human hair in 0%, 4%, 8%, 12%, 16% were used in the laboratory for grade M40

V. RESULTS AND DISCUSSION

5.1 Compressive Strength

Table 5.1 Compressive strength of M40 grade concrete reinforced with 0%, 4%, 8%, 12% and 16 % human hair.

S. No.	Mix	Human hair content (%)	Compressive strength (MPa)	
			7 Days	28 Days
1.	M0 (control mix)	0	31	50
2.	M10	4	32	52
3.	M20	8	34	54
4.	M30	12	36	53
5.	M40	16	34	52

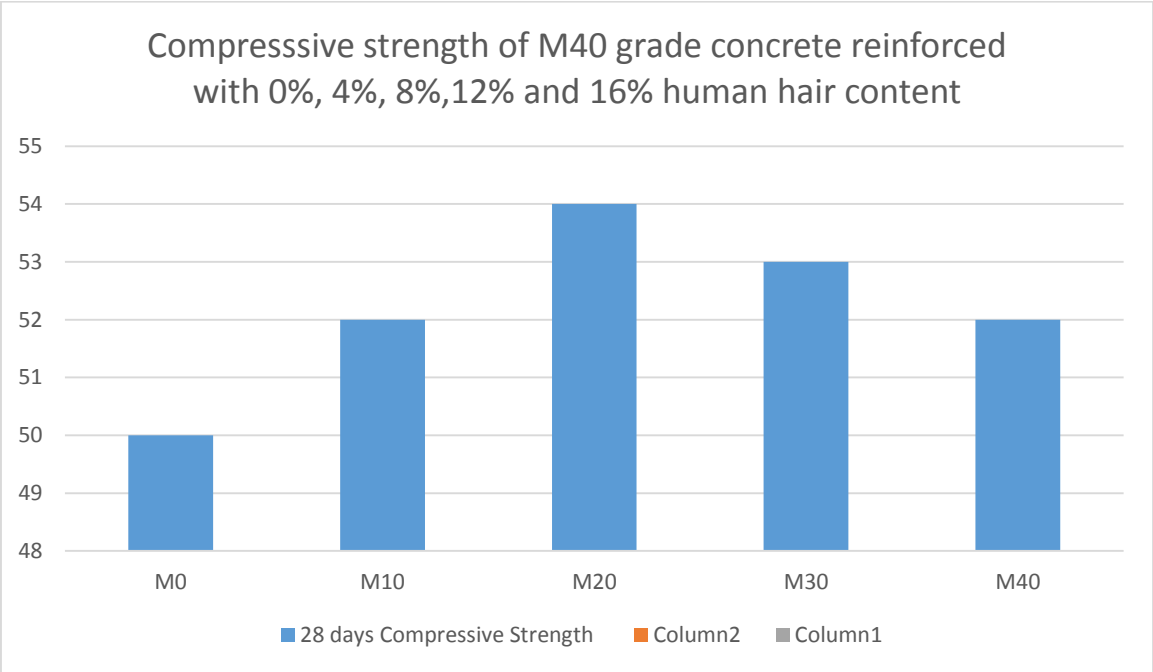

Fig. 5.1 Compressive strength of concrete with 0%, 4%, 8%, 12% and 16% human hair content at 28 days

It can be seen from fig. 5.1 that use of human hair content for reinforcing concrete results in increased compressive strength. Compressive strength for all mixes containing 4%, 8%, 12% and 16% hair content found more than the conventional control concrete. Maximum 7 days compressive strength were found at 12% human hair content and maximum 28 days compressive strength were found at 8% human hair content respectively.

VI. CONCLUSIONS

On the basis study it was observed that addition of human hairs to the concrete modifies compressive strength properties at 7 days and 28 days. Hence it can be concluded that human hair fibres give ideal choice of fibres in concrete if used in correct proportion and manner and human hair fibre has other advantages like it is completely biodegradable, renewable and easily available at negligible cost.

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