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Effect of Natural And Artificial Fiber On Concrete

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Abstract— The present day world is witnessing the construction of very challenging and difficult civil engineering structures. Quite often, concrete being the most important and widely used material is called upon to possess very high strength and sufficient workability properties. Efforts are being made in the field of concrete technology to develop such concretes with special characteristics. Researchers all over the world are attempting to develop high performance concretes by using fibers and other admixtures in concrete up to certain proportions. In the view of the global sustainable developments, it is imperative that fibers like Natural and Artificial fibers provide improvements in tensile strength, fatigue characteristics, durability, shrinkage characteristics, impact, cavitations, erosion resistance and serviceability of concrete. Fibers impart energy absorption, toughness and impact resistance properties to fiber reinforced concrete material and these characteristics in turn improve the fracture and fatigue properties of fiber reinforced concrete research in hair and basalt fiber reinforced concrete resulted in the development of an alkali resistance fibers high dispersion that improved long term durability.. In the present experimental investigation the alkali resistance basalt and hair fibers has been used to study the effect on compressive and flexural strength on M40 grades of concrete. By using 1% of hair fiber and 1% of basalt fiber.we find that there is increase in both compressive and tensile strength up to 2% for hair and 3% For basalt fiber.but we did not find increase in strength of compressive and tensile for combination hair and basalt fiber.

Keywords- Natural; Artificial; Durability; flexural strength; ductility

I. INTRODUCTION

Fiber Reinforced Concrete can be defined as a composite material consisting of mixtures of cement, mortar or concrete and discontinuous, discrete, uniformly dispersed suitable fibers. Continuous meshes, woven fabrics and long wires or rods are not considered to be discrete fibers. Fibers include steel fibers, glass fibers, synthetic fibers and natural fibers.

Hairs are used as a fiber reinforcing material in concrete to study its effects on the compressive, crushing, flexural strength and cracking control to economize concrete and to reduce environmental problems created by the decomposition of hair.

Fiber reinforced concrete can offer a convenient, practical and economical method for overcoming micro-cracks and similar type of deficiencies. Since concrete is weak in tension hence some measures must be adopted to overcome this deficiency. Human hair is strong in tension; hence it can be used as a fiber reinforcement material. Hair Fiber (HF) an alternate non-degradable matter is available in abundance and at a very cheap cost. It also creates environmental problem for its decompositions. Present studies has been undertaken to study the effect of human hair on plain cement concrete on the basis of its compressive, crushing, flexural strength and cracking control to economize concrete and to reduce environmental problems. Experiments were conducted on concrete beams and cubes with various percentages of human hair fiber i.e. 0%, 1%, 2 % and 3 % by weight of cement. For each combination of proportions of concrete one beam and three cubes are tested for their mechanical properties. By testing of cubes and beams we found that there is an increment in the various properties and strength of concrete

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by the addition of human hair as fiber reinforcement.

Hair is used as a fiber reinforcing material in concrete for the following reasons:

- It has a high tensile strength which is equal to that of a copper wire with similar diameter.
- Hair, a non-degradable matter is creating an environmental problem so its use as a fiber reinforcing material can minimize the problem.
- It is also available in abundance and at a very low cost.
- It reinforces the mortar and prevents it from spilling.

II. LITERATURE REVIEW

2.1. Basalt Fiber

Basalt fiber is a relative newcomer to fiber reinforced polymers (FRPs) and structural composites. It has a similar chemical composition as glass fiber but has better strength characteristics, and unlike most glass fibers is highly resistant to alkaline, acidic and salt attack making it a good candidate for concrete, bridge and shoreline structures.

Table 1. properties of basalt fiber

Property	Value
Cross Section	Flat
Length of fiber	12 mm
Color	Brownish
Specific gravity	2.65

2.2. Hair Fibre

Jain D. and Kothari A: - Fiber reinforced concrete can offer a convenient, practical and economical method for overcoming micro-cracks and similar type of deficiencies. Since concrete is weak in tension hence some measures must be adopted to overcome this deficiency. Human hair is strong in tension; hence it can be used as a fiber reinforcement material. Hair Fiber (HF) an alternate non-degradable matter is available in abundance and at a very cheap cost. It also creates environmental problem for its decompositions. Present studies has been undertaken to study the effect of human hair on plain cement concrete on the basis of its compressive, crushing, flexural strength and cracking control to economize concrete and to reduce environmental problems. Experiments were conducted on concrete beams and cubes with various percentages of human hair fiber i.e. 0%, 1%, 1.5%, 2%, 2.5% and 3% by weight of cement. For each combination of proportions of concrete one beam and three cubes are tested for their mechanical properties. By testing of cubes and beams we found that there is an increment in the various properties and strength of concrete by the addition of human hair as fiber reinforcement.

Table2. Properties of fibre reinforcement

Property	Value
Cross Section	Circular
Diameter	14 Micron
Length of fiber	12 mm
Color	Black
Specific Gravity	Nil

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2.3 Advantages of fiber reinforced concrete:

Fiber reinforced concrete has started finding its place in many areas of civil infrastructure applications especially where the need for repairing, increased durability arises. FRC is used in civil structures where corrosion is to be avoided at the maximum. Fiber reinforced concrete is better suited to minimize cavitations /erosion damage in structures such as sluice-ways, navigational locks and bridge piers where high velocity flows are encountered. A substantial weight saving can be realized using relatively thin FRC sections having the equivalent strength of thicker plain concrete sections. When used in bridges it helps to avoid catastrophic failures. In the quake prone areas the use of fiber reinforced concrete would certainly minimize the human casualties. Fibers reduce internal forces by blocking microscopic cracks from forming within the concrete.

2.4 Disadvantages of fiber Reinforced Concrete:

The main disadvantage associated with the fiber reinforced concrete is fabrication. The process of incorporating fibers into the cement matrix is laboured intensive and costlier than the production of the plain concrete. The real advantages gained by the use of FRC overrides this disadvantage.

2.5 Effect of Fiber Type on the Mechanical Properties of Normal and High Strength Concrete:-

Results of an experimental investigation of the behavior of fiber reinforced concrete (FRC) are presented in this paper. Properties investigated included compressive strength, splitting tensile strength and flexural strength. The independent variables were fiber type, cement content and the presence of silica fume. Two different fiber types (Basalt "B" and natural fiber) were used in this investigation with volume fractions of 1%, 2% and 3%, respectively. Cement contents were used 450 kg/m3. Silica fume was added to concrete with the higher cement content by 10% of the cement weight. These three types of Portland cement concrete mixes PCs were used as control groups for the different FRCs. Results of the present work indicated that, the addition of single type of short fibers slightly increased the compressive strength of normal strength FRC. Their effect further decreased as the concrete matrix grade increased. The presence of fibers also increased slightly the splitting tensile strength of FRC at different concrete grades. While hair and basalt FRC mixes showed only a slight improvement in the flexural strength when compared to the results of their corresponding high strength plain concrete (HSPC) mixes, steel fiber reinforced concrete (SFRC) mixes showed post peak ductility and toughness, which can be related to its good mechanical bond due to the filament twin fiber geometry. Therefore, the increase of concrete strength provided by single fibers with small volume fractions and with high level of coarse aggregate content was quite small and the increase in flexural ductility and toughness is considered the primary motive for using fibers in concrete.

III. THE METHODOLOGY AND INVESTIGATIONS

3.1. Concrte mix design

Table 3. Mix Proportion for One Cubic meter Conventional M25 Grade Concrete.

Water	Cement	FA	CA
0.40	1	1.72	2.73

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IV. TEST RESULTS AND DISCUSSIONS

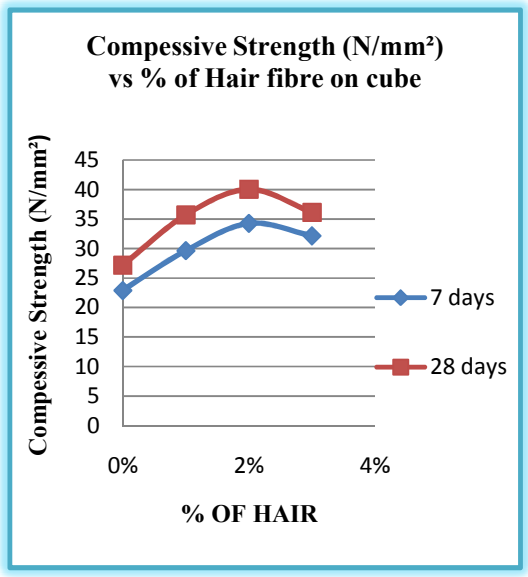

Figure 1. Comp. Strength vs % of Hair fiber

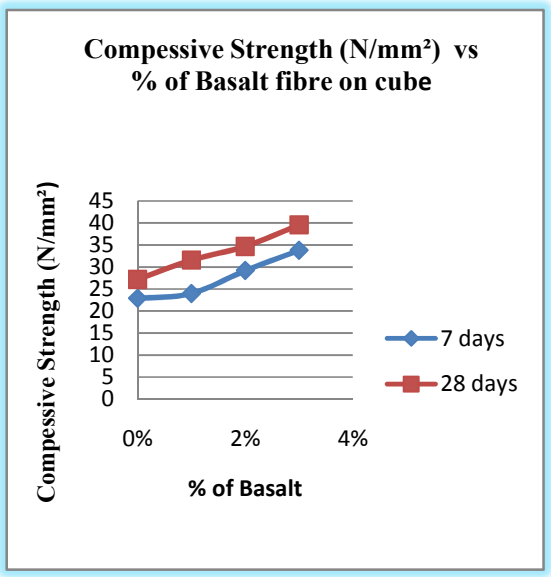

Figure 2. Comp. Strength vs % of Basalt fiber

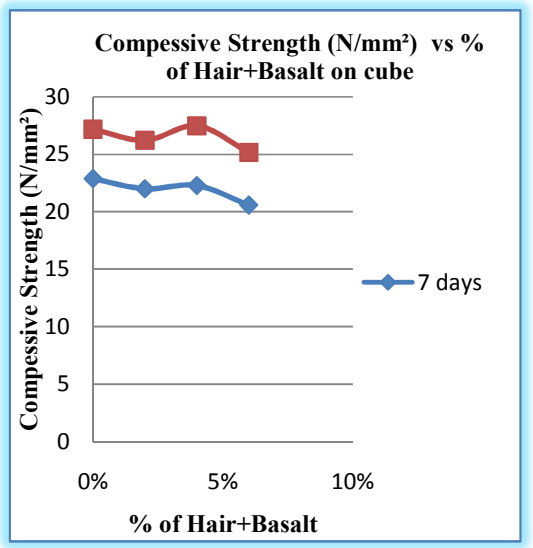

Figure 3. Comp. Strength vs % of Hair+Basalt fiber

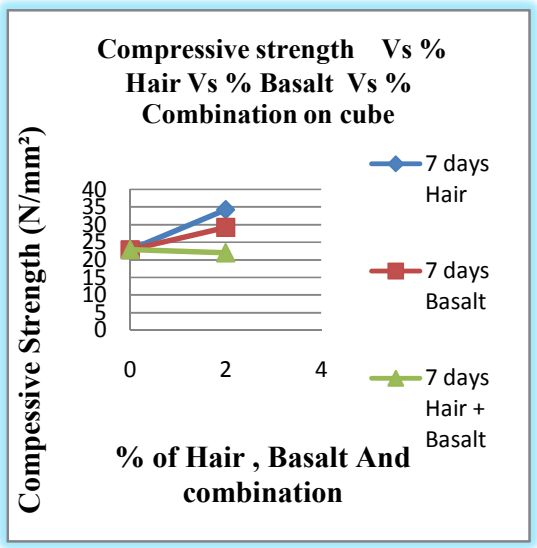

Figure 4. Comp. str.Vs % Hair Vs % Basalt Vs % Combination on cube

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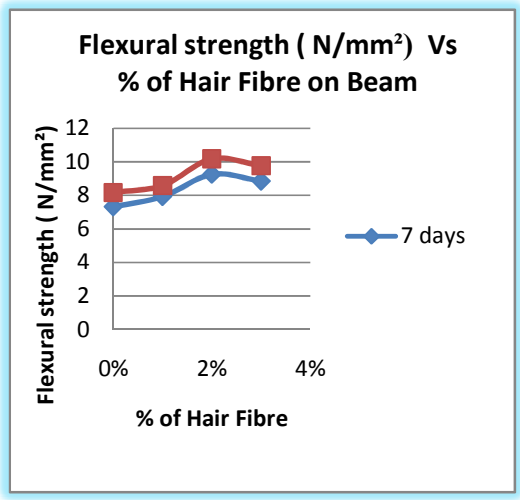

Figure 5. Flexural strength Vs % of Hair Fiber

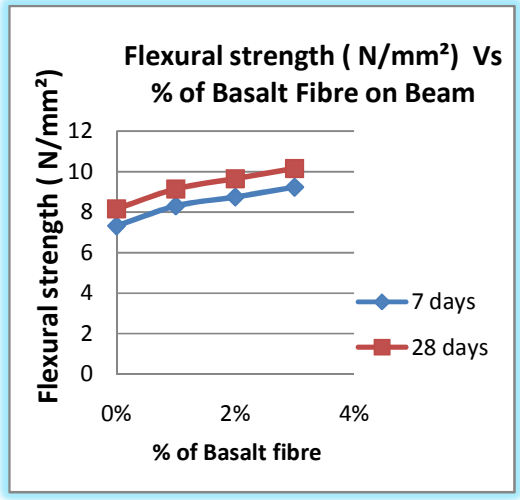

Figure 6. Flexural strength Vs % of Basalt Fiber

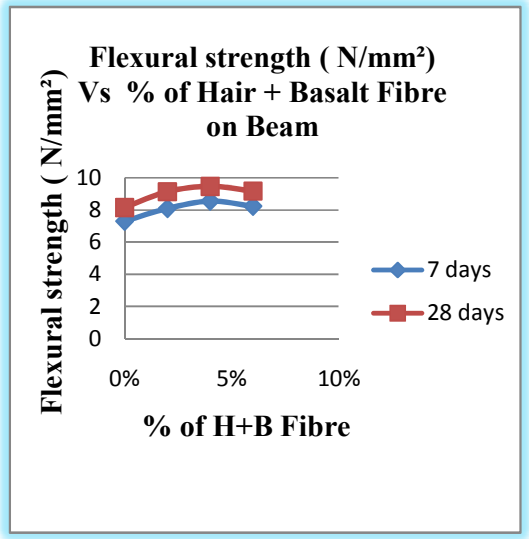

Figure 7. Flexural strength Vs % of Hair + Basalt Fiber

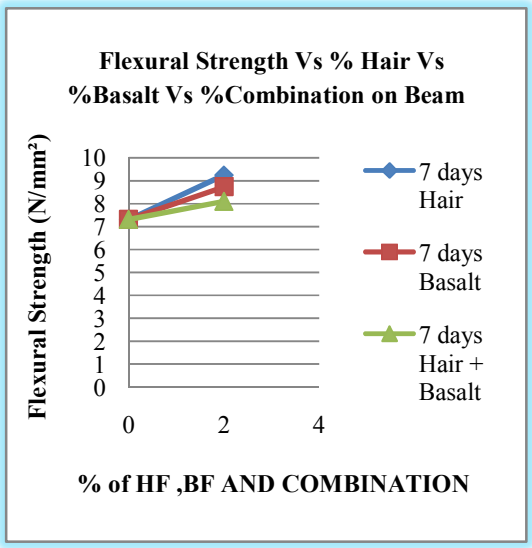

Figure 8. Flexural Strength Vs % Hair Vs %Basalt Vs %Combination

V. CONCLUSION

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.

- As we are increasing the percentage of hair by the weight of cement. We find that there is increase in the percentage of hair up to 2 %. There is increase in the strength of concrete. In both the test compression as well as flexural strength.
- Increase in the percentage of basalt we find that there is increase in the strength of concrete up to 3%.In both the test compression as well as flexural strength.

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- But as in the case of basalt and hair fiber combination .we doesn't find much greater strength as compare to hair and basalt without any combination in both the test.
- If we go for the less percentage of Hair and Basalt fiber. We may find that there will increase in the strength of concrete.

REFERENCES

[1] Jain D. and Kothari A: - Research Journal of Recent Sciences ISSN 2277 - 2502 Vol. 1(ISC-2011), 128-133 (2012) Res.J.Recent.Sci. Sanghvi Institute of Management and Science, Indore, MP, INDIA

[2] Majumdar A.J., "Fibre cement and concrete - a review", Garston: Building Research Establishment, (1975) http://www.crossref.org/SimpleTextQuery/.Preserve .

[3] Johnston Colin D., Fiber reinforced cements and concretes, Advances in concrete technology volume 3 – Gordon and Breach Science publishes,2001.

[4] Gambhir M.L., Concrete Technology,2009.

[5] Shetty M.S., Concrete Technology, 2009.

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