IJCRT.ORG ISSN : 2320-2882

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

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Abstract: *Fiber Reinforced concrete (FRC) is concrete containing fibrous material which increase as structural and is gaining importance. It contains short discrete fibers thar are uniformly distributed and randomly oriented. The concept of using fibers as reinforcement is not new. Fibers have been used as reinforced since ancient time. Historically, horsehair was used in mortar straw in mud bricks. In the early 1900s, asbestos fibers were used in concrete, and in the 1950s the concept of composite materials came into being and fiber reinforced concrete was one of the topics of interest.*

Experiments were conducted on concrete cubs, cylinder and beam of standard size with addition of various percentages of human hair fibre i,e.. 0%, 0.5%, 1% and 1.5% by weight of cement fine & coarse aggregate and result were compared with of cement ,of plane cement concrete M-20 grade. For each percentage of human hair added in concrete , four cubes, three cylinders and three beams were tested for their respective mechanical properties at curing periods of 3, 7 and 28 days. Optimum hair fibre content was obtained as 1.5% by weight of cement

Index Terms - Human hair, concrete, fibre reinforcement

I. INTRODUCTION

Fibre reinforcement 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 early 1900s, asbestos fibres were used in concrete, and in the 1950s the concept of composite materials came to being and fibre reinforced concrete was one 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.

A fiber is a small piece of rein forcing material possessing certain characteristics properties. Addition of fibers to concrete in fluencies its mechanical properties which significantly depend on the type, length and percentage of fiber. Generally, concrete is weak in tension and has a brittle character. He'llce fibers are added to increase its tensile strength and imp rove the characteristics of construction materials .

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Fibre are usually used in concrete for the following reasons:

To control due to both plastic shrinkage and drying shrinkage and drying shrinking.

They also reduce the permeability of concrete and thus reduce bleeding of water.

They produce greater impact, ductility, strength, abrasion and shatter resistance in concrete.

The fineness of the fibre allows them to reinforces the mortar fraction of the concrete, delaying crack formation and propagation.

This fineness also inhibits bleeding in the concrete, thereby reducing permeability and improving the surface characteristics of the hardened surface. But use of higher percentage of fiber is likely to cause segregation and harshness of concrete and mortar.

The fiber is often described by a convenient parameter called aspect ratio. The aspect ratio of the fiber is the ratio of its length to its diameter. Its value varies for different fibers. Reinforced Concrete with high aspect ratio was found to have improved effectiveness. The modulus of elasticity of matrix must be much lower than tough fiber for efficient stress transfer. The interfacial bond between the n:iatrix and the fiber also determine the effectiveness of stress transfer, from the matrix to the fiber. A good bond is essential for improving tensile strength of composite. Basically. the hair thread has a cylindrical structure, highly organized, formed by inert cells, most of them keratinize d 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 flexible and mechanical resistance. Human hair has about 65-95% of its weight in proteins, 32% of water, lipid pigments and other components Why human hair a fiber?

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

- It has high ten sale strength which is equal to that of copper wire with similar diameter.
- Hair, a non- degradable matter is creational a environmental problem so it used as fibro reinforcing material can minimize the problem.
- It also available in abundance and at a very low cost.

It reinforces the mortar and prevents it from spelling

In this e experimental study, human hair fibers are incorporated into concrete at content of 0.5, I and 1.5 % by weight of cement. Cubes, beams and cylindrical specimen are casted and cured properly for evaluating various mechanical properties. These specimens made of human hair fiber reinforced concrete are tested at 3, 7 and 28days and the change in mechanical properties when compared to plain cement concrete is observed.

COMPRESSIVE STRENGTH TEST :

The experimental work involves casting of concrete cubes for determination of compressive strength for 3,7,28 days. Cubes were casted for (3mm,20mm,37.5mm) sizes of aggregate percentage of (100%, 50%, 75%-25%, 25%-75%) of concrete. The test setup for the compressive strength and typical failure pattern is shown in photos. Compressive strength is calculated by load divided by area and the unit N/mm^2

M20 Grade 100%		
Size of aggregate	days of	Compressive strength N/mm2
3mm	3 days	10
	7 days	14
	28 days	21
20 mm	3 days	11
	7 days	16
	28 days	23
37.5 mm	3 days	13.5
	7 days	18
	28 days	25

CONCLUSION

The results obtained specify in a clear way that the incorporation of 2mm (25%) & 20mm (75%) improves the compressive strengths (compressive, flexural and tensile strengths) of the concrete. The improvement of the mechanical strength is due to the correction of the physical properties (improved grading, low porosity, high compactness, etc..,) of the concrete. This study shows the importance of this method to make concrete with binary sizes in order to correct the physical properties of aggregate. Using coarse aggregate in a mixture of different sizes in various proportions, allows to obtain a high strength concrete. The main objective of this experimental work is to valorise local materials and quarry wastes by using them in construction. I aims at the study of the effect of use of coarse aggregate as partial replacement in various percentages (0%, 25%, 50%,75%) on the mechanical properties of concrete made with binary natural coarse aggregates. Aggregate type has effect on the compressive strength of normal concrete. Highest compressive strength was achieved from concrete containing 3mm (25%) & 20mm(75%) followed by 20mm (25%) & 37.5mm (75%) concrete containing as coarse aggregate. It is suggested that mixed proportions of different size aggregate may be employed for concrete work in places where concrete practitioners have variety of choices available.

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STUDY ON HUMAN HAIR IN CONCRETE AS A FIBER REINFORCEMENT
Journal of Emerging Technologies and Innovative Research JETIR April 2021, Volume 8, Issue 4