

A Study on the Properties of Concrete by using Different Types of Fibers- A Review

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Abstract: From the previous few decades, many researches are going on in finding the physical and the mechanical properties of the concrete. Nowadays fiber reinforced concrete has been playing a very crucial role in the construction fields because of its various properties. The different types of fibers which we are going to use in this research are Nylon fiber, Human hair fiber, Polypropylene fiber, Jute fiber. As Concrete is good in compression and it is weak in tension, these fibers mainly improves the tensile strength of the concrete structure. In this research, we are going to check the effect of these fibers on the compression, flexural and tensile strength of the concrete structure.

Keywords: Conventional concrete; Admixtures; Nylon fiber; Polypropylene fiber; Jute fiber

1. INTRODUCTION

In any structure either high rise or a normal structure 3 members are a very essential slab, beam, and column in which slab transfers the axial load into the beam in the form of line load, then this line load is converted to point load when transferred to the column. In this process, the measuring parameters play an important role. In the current world, the demand for steel, cement, and aggregates is increasing rapidly. So it is very necessary to find a successful alternative of these things to satisfy the need for concrete production.

1.1 Polypropylene fibers-

Polypropylene filaments are synthetic varieties of the new era. They are made on a large scale and are the fourth largest in volume after polyesters, polyamides, and acrylic. Polypropylene strands were first proposed in 1965 or the US Corps of Engineers [1, 2] for use as an admixture in concrete for the development of implicit impact safe structures. Monofilament polypropylene filaments can be used in much lower materials than steel strands. Hardness and other mechanical properties are enhanced by the resulting multi-arrangement drawing. The thickness of these strands is low (0.9 g / cc). They are exceptionally crystalline, with high density and amazing protection from attack by substances and bacteria. The crystalline of these varieties is approximately (70%), while the sub-atomic weight (80,000 to 300,000 g / mole) [3-7]. Polypropylene fiber reinforced concrete (PFRC) is an embryonic development material that can be characterized as having high mechanical quality, solidity, and strength. The concrete ideal use of materials is accomplished by using polypropylene strands as well as cost reduction. Concrete has better pressure inhibition while steel has greater resistance to stress. Ordinary concrete impedes flexibility, low impact and little protection from scattered spot obstruction and splitting. A decent concrete should have high quality and low penetration capacity. Subsequently, elective mixed substances are gaining fame as a result of freezing and connective freezing. To improve the post breaking conduct, small intermittent and discrete filaments are added to the plain concrete. The range expands post top malleability performance, pre-brake rigidity, crack quality, ambulance, sway, flexural quality constraint, exhaustion performance and beyond. The compatibility of fiber reinforcing cement depends on the ability of the strands to connect the brakes at critical levels of the strass. The expansion of polypropylene strands reduces the unit weight of cement and increases its quality [8-12].

The solid ideal use of materials complements the use of polypropylene filament as well as cost reduction. This paper shows a far-reaching survey at various angles that polypropylene fiber is a strong cement about the conduct, applications, and performance of fortified cement.

1.2 Nylon fiber

Since older occasions, varieties have been used to reinforce the delicate materials. The straw had been used to strengthen sunlight Blocks, and horsehairs were used for brick's work and reinforcing mortar. A Pueblo house operated around 1540,

Considered to be the most established home in the US, it is made of incense adorned with straw, fortified with straw. Also, Later, the commercial use of asbestos strands in the Bond Glue network began on a large scale. Hatsek process in 1898. Asbestos bond development items are all widely used through current reality. Nevertheless, basically because Understanding the dangers related to asbestos filaments, fiber types were introduced through the 1960s.1970s. At present, there is a wide scope of designing materials (pottery production, plastics, bond, and gypsum count) Items) join strands to improve overall qualities. Better properties include hardness, Compressed Quality, Flexible Modulus, Diffusion Barrier, Partition Control, Toughness, Exhaust Life, Safety Avoidance, What's more, scattered locations, shrinkage, growth, hot properties, and imperviousness to fire. Licenses including the use of test preliminaries and irregular steel fixture components, for example, wire Parts, nails, and metal chips - to improve the properties of concrete date from 1910. Mid-1960s. The main critical test was made to assess the capacity of steel strands as fortifications for the US, Solid. From that point forward, an important measure of research, advancement, experimentation and modern application Steel fiber is of fortified cement. Glass fibers were first used in concrete in the USSR in the late 1950s. It was resolved immediately Common glass strands, for example, borosilicate E-glass filaments were attacked and eventually excreted by salt. Solid glue. Effective improvement work was coordinated towards delivering a type of salt safe glass Varieties containing zirconia. This inspired a large number of popular items. The largest use of the glass fiber reinforced cement is for the manufacture of outside engineering cladding boards.

1.3 Jute fibers -

Concrete is an important development material. Concrete is powerless under pressure. In this way, improvement in the hardness of cement is important. In traditional practice hair, steel fiber and so on are used to improve the properties of cement. Fiber support of solids is another consideration in the medium (Choi et al; 2007). Fiber fortification does not affect the symmetry of the concrete material and improves its quality properties (Panchal et al; 2017). Fiber fortification capture the break and prevents the propagation of partitions in the concrete. The general goal of this proposal is to lead exploratory examinations on the flexible and compressive properties of jute fiber-reinforced cement (JFRC), with the speculation that "reinforcing cement with jute fiber essentially results in the flexible and compressive quality of cement Makes improvements. " In perspective on common sites, the clear goals with this proposal are 1. To meet flexible and compressed quality testing on concrete reinforced with privately constructed jute fiber. 2. Dissecting the test results to determine the flexible and compressed quality properties of the JFRC. 3. To survey the productivity of jute fiber as a fortification by assessing the commitment in the quality of JFRC examples.

2. LITERATURE

Subramanian et.al In this research Nylon fiber is added in four different percentage in concrete which are 0.00%,1%,2%, and 3%. It was concluded that the addition of nylon fiber on concrete shows a significant increase in compressive and split tensile strength. In this, the conventional concrete is compared with nylon fiber concrete. From the studies, it has been concluded that the nylon fiber concrete gives better strength than conventional concrete.

Pushpan S et.al. examined strength properties of concrete by addition of nylon fiber in various percentages (0%, 0.25%, 0.50%, 0.75%, and 1%). As we make an increase in the percentage of fiber there is a decrease in the workability of concrete. When the percentage of fiber increased the slump value and compacting factor get decreased compared to conventional concrete. There is an improvement in compressive strength by 26.26% when nylon fiber is added at 2.25% and in flexural strength, with the addition of nylon fiber, there is increase strength by 89.47% as compared to conventional concrete.

Jaya Saxena and Anil Saxena examined a comparison between nylon fiber concrete and conventional concrete. Nylon fiber is added in varying percentages and curing is done for 7,14, and 28 days. It has been concluded that the nylon fiber concrete shows an increase in compressive strength as compared to conventional concrete. In conventional concrete, cement replaced by 10%,20% and 30% with fly ash. The comparative study of all mixed the result obtained. It has been concluded that with the addition of 10% fly ash,90% cement, and 0.2%,0.25%, and 0.3% nylon fiber there is a significant increase in the strength properties of concrete.

Hanif M et.al In this study the results showed a positive effect when nylon fiber is added at a percentage of 0.5% on the compressive and tensile strength. The advantage of using nylon in concrete is that it increases the load-carrying capacity of cement-based mortar and also increases its plasticity which helps when failure due to cracking occurs and improves the flexural strength of concrete. It has been concluded that by adding 0.5% of nylon fiber in concrete it increases the compressive strength, tensile strength, and flexural strength. By adding nylon fiber in concrete it helps to reduce plastic waste and helps to conserve the environment.

Swami and Gupta examined various proportions of nylon fiber in concrete and check its effect on workability, compressive strength and tensile strength. The effect of reduced workability is seen in the compressive strength test. When nylon fiber is added in concrete there is an increase in compressive strength. When the percentage of nylon fiber get increases by up to 1% there is a decrease in compressive strength. There is an increase in tensile strength by 60 -70% with the addition of nylon fiber

Akaram Ali et.al In this study they concluded that by addition of a variable proportion of nylon fiber in concrete its effect on compressive strength, workability, and tensile strength is reported. In this paper nylon fiber of diameter 0.35mm and length of 50mm with an aspect ratio of 143 is used in different percentages from 0.5 to 1.5% by weight of the cement. After adding a certain amount of nylon fiber various properties like compressive strength, split tensile strength and flexural strength will be studied. The addition of nylon fiber in concrete showed an increase in tensile strength in concrete. As nylon fiber is a waste product its addition in concrete helps to conserve the environment.

Amsa and Ariyannan examined that 0.5% addition of polypropylene fiber in concrete shows an increase in split tensile and flexural strength. The presence of polypropylene fibers had caused a delay in starting the degradation process by reducing permeability, reducing the amount of shrinkage and expansion of concrete that can significantly affect the lifespan of the structure. There is a decrease in slump flow when polypropylene fibers are added in ratios of 0.3% and 0.5% split tensile strength is increased as the volume percentage of polypropylene fibers. The load-carrying capacity of beams increased by the addition of 0.3% of concrete.

Raval and Patel studied that Concrete is one such basic component in which various improvements are always upgraded by the addition of different admixtures. Jute fibers can be used to improve concrete various properties and strength without having any environmental damage. It is hereby concluded that the addition of jute fibers in concrete shows a 33% to 10% increase in the compressive strength and split tensile strength.

3. CONCLUSIONS

This study of different types of research papers concluded that

1. Fibers can successfully be an alternative of fine aggregates to increase the tensile capacity of a concrete member.
2. Use of these nylon fiber can be beneficial for column element also
3. Nylon fiber can be successfully replaced by 1% of the fine aggregate to increase the tension capacity of the concrete member.
4. Nylon fiber can successfully be utilized in the form of mortars also for a sustainable cement mortar which provides a good environmental change by reusing the waste nylon.
5. As plastic is the biggest environmental pollutant in today's world it's fibers can be successfully used in the concrete which also reduces the problem of permeability, shrinkage and slump decrease.
6. 0.5% usage of polypropylene fiber can be easily used in concrete which can increase the tension, flexural and split tensile strength of the concrete.
7. Jute fibers can increase the strength up to 32% which also protects the concrete from the sulphate attacks and jute waste can be easily utilized.

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