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ANALYSIS OF PROPERTIES OF CONCRETE USING STEEL FIBERS AS FIBER REINFORCEMENT ADMIXTURE

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Abstract

Fiber reinforced concrete is composite material consisting of mixtures of cement, mortar or concrete, discontinuous discrete uniform dispersed suitable fibers. Fiber reinforced concrete are of different types and properties. In this paper analysis of properties of concrete using steel fibre as fiber reinforcement admixture is studied and verified the strength of concrete to normal plane concrete with absence of admixtures. Using steel fibers as fiber reinforcement admixture increases bond strength by enhancing surface tension as steel is better in taking flexural strength this gives better results, hence we can use this steel fiber reinforcement to concrete where the compressive and flexural strength place a crucial role in construction and maintenance.

Keywords: Steel Fiber Reinforcement Admixture; Compressive Strength; Flexural Strength; Grade of Concrete.

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1. Introduction

Fiber-reinforced concrete is concrete containing fibrous material which increases its structural integrity. Fibers include steel fibers, glass fibers, synthetic fibers and natural fibers. In addition the character of fiber-reinforced concrete changes with varying concretes, fiber materials, geometrics, distribution, orientation and densities.

The fiber is often describes by a convenient parameter called "aspect ratio". The aspect ratio of the fiber is the ratio of its length to its diameter. Typical aspect ratio ranges from 30 to 150. Fibers in concrete have limited effort on the impact resistance of the materials [1] [2].

Steel fiber technology actually transforms a brittle material into a more ductile one. Catastrophic failure is virtually eliminated because the fibers continue supporting the load after cracking occurs, Steel fiber reinforced concrete exhibits higher post-crack flexural strength, better crack resisters improved fatigue strength, higher resistance to spalling and highest leading crack strength.

When the fiber reinforcement is in the form of short discrete fibers, they act effectively as rigid infusions in the concrete matrix [3].

The influence of the following two major parameters on the pull-out behavior of fiber in this work is

- The angle of orientation of fiber.
- Number of fibers being simultaneously pulled out.

These results seem to explain why the addition to a concrete matrix of fibers with highly improved bond properties does not often lead to an equivalent improvement in the composite properties [4].

Steel fiber used as fiber reinforcement admixture the flexural and compressive strength of concrete has increased. This literature helps author in comparing it with general ordinary Portland cement.

2. Methodology

Steel fibers that are bought for mixing must be thoroughly verified as they must be free from all rust signs and their surface without cracks. These steel fibers must be mixed as an admixture. These steel fibers are brought for utilization using “aspect ratio”. Suitable process require suitable time of mixing ingredients with correct proportion as per Indian standard codes. Care must be taken such that the concrete must not be mixed with excess water as water makes less interlocking with steel fibers. Target strength of concrete was determined by the equation

Target steel fibers required = f’ck= fck +1.65(s)—[eq1]. According to the standard code from IS10262-2009.

The amount of hair admixture was calculated from the following equation,
Volume of steel fibers = (mass of chemical admixture/specific gravity of admixture *1000)—[eq2].

The specific gravity of steel fibers varies from 1.32 to 5.88. The mean specific gravity of steel fibers 2.57 was considered in this study [5][6]. The cube casted for the size $15cm^3$ the compression and flexure strength were tested for 1,7,14,21,28 days after casting.

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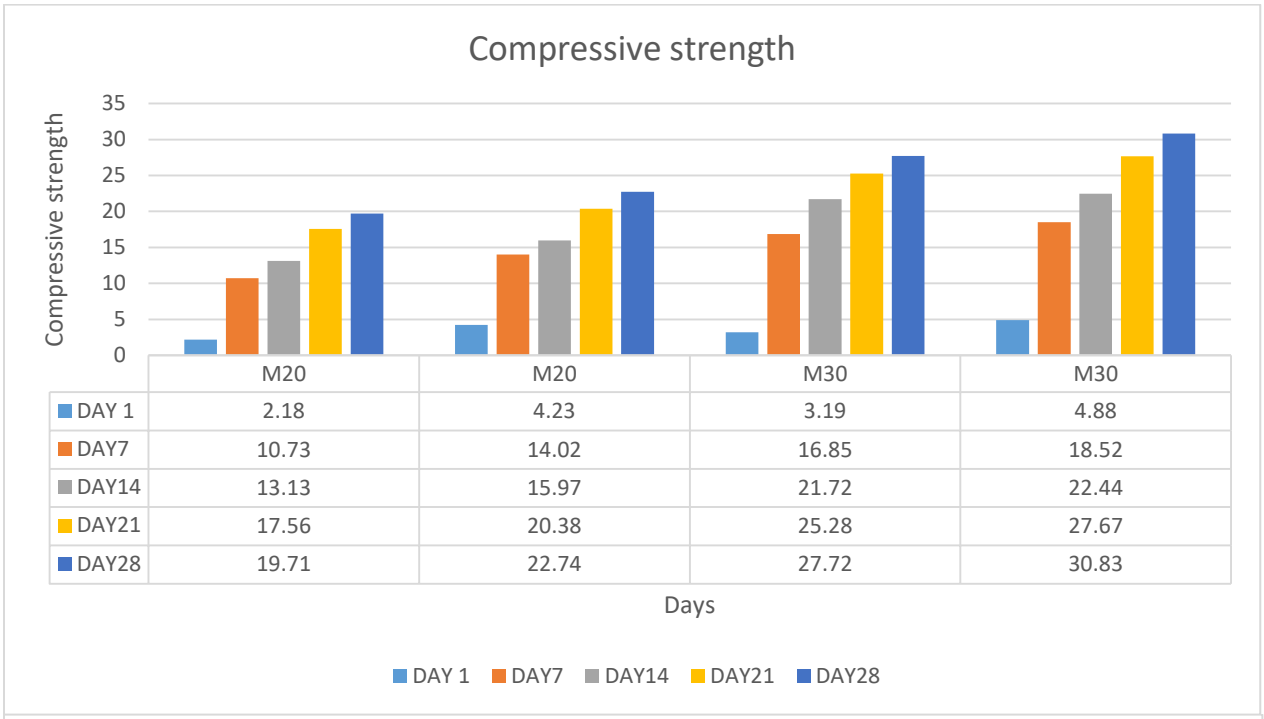
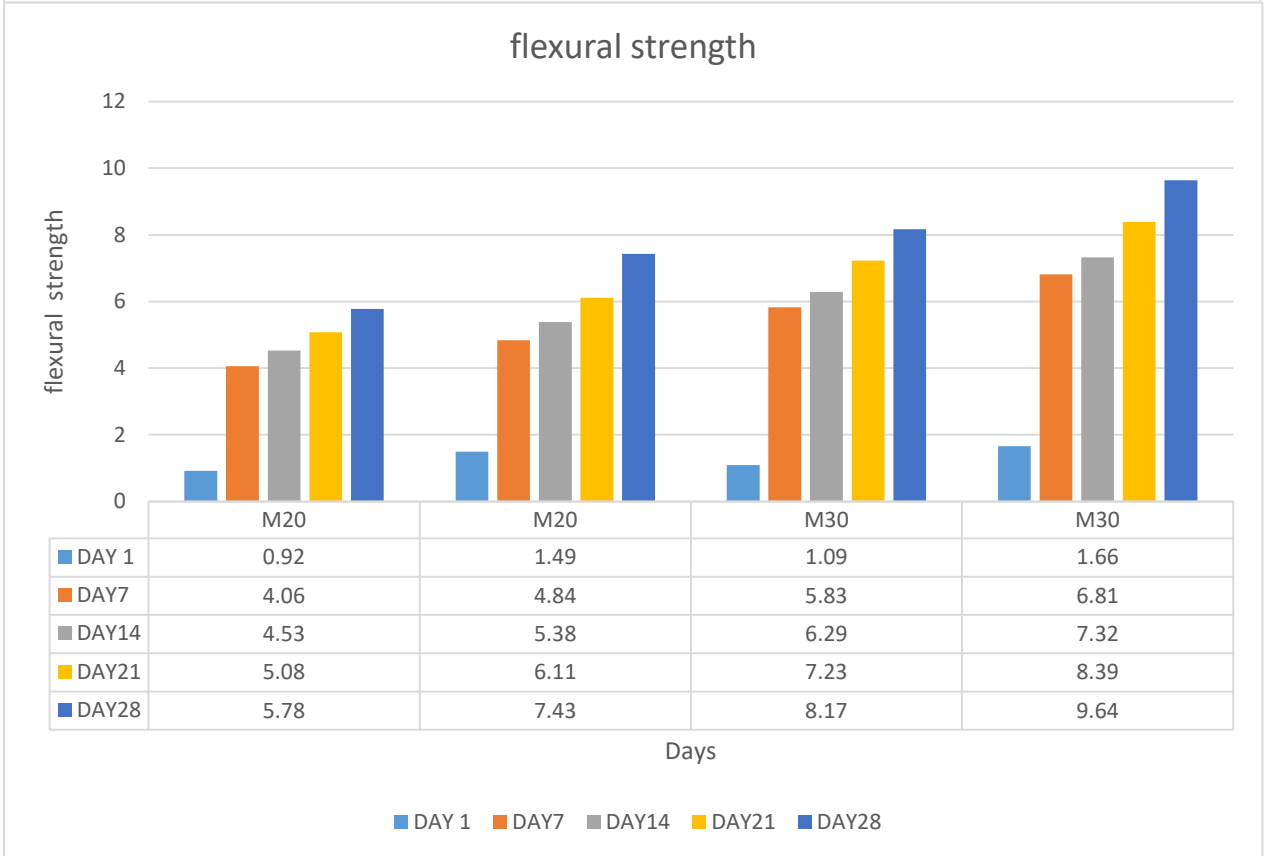
3. Results and Discussions





4. Conclusions & Recommendations

From fig (1) it can be observed that M20 and M30 grade concrete with steel fiber reinforcement admixture can with stand more compressive load that is 22.74 MPa and 30.83 MPa respectively for 28 days compared to normal concrete obtaining 19.71 and 27.72MPa for 28days. This shows great increment of 13.32% and 10.11% in compressive strength by M20 and M30 grade of concrete.

In fig (2) shows flexural strength development in concrete. Present study reveals that steel fiber reinforced concrete with stands 7.43 and 9.64 MPa comparatively to the normal concrete with standing 5.378 MPa and 8.17 MPa. Hence about 22.20% and 15.20% increment in flexural strength.

Hence by this it's clear that using steel fiber reinforcement admixture enhances the both compressive strength and flexural strength.

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