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COMPARATIVE STUDY OF REINFORCED CEMENT CONCRETE FIBRE REINFORCED CONCRETE & TEEXTILE REINFORCED CONCRETE

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ABSTRACT
The project work is on the study of textile fibre reinforced concrete by comparison with other reinforcing material . The influence of type of fibres and their content on the characteristics of textile fibre reinforced concrete having different volume fractions are studied . Fibres include steel fibres , glass fibres , synthetic fibres and natural fibres each of which lend varying properties to the concrete. Textile-reinforced concrete is a type of reinforced concrete in which the usual steel reinforcing bars are replaced by textile materials. Instead of using a metal cage inside the concrete, this technique uses a fabric cage inside the same. Materials with high tensile strength with negligible elongation properties are reinforced with woven or non woven fabric The fibres used for making the fabric are of high tenacity like jute, glass fibre, Kevlar, polypropylene, polyamides (Nylon) etc. The weaving of the fabric is done either in a coil fashion or in a layer fashion. Molten materials, ceramic clays, plastics or cement concrete are deposited on the base fabric in such a way that the inner fabric is completely wrapped with the concrete or plastic. This project will explores the important features, properties and advantages of textile-reinforced concrete. Tensile-reinforced concrete produces structures that are thin and malleable in nature. Textile reinforced concrete (TRC) is an innovative high performance composite material which has revealed many promising attributes in various applications but test methods need to be established to reduce uncertainty and the need for extensive experimental studies. The aim of this project was to evaluate the flexural behaviour of jute textile reinforced TRC . As well are we are going to compare the textile reinforced concrete with steel and fibre reinforced concrete. This is a comparative study between steel bars , steel fibres and jute fabric as a reinforcing material in RCC , FRC & TRC .

Keywords:
Textile, fabric, flexural behaviour, fibres, bond, strength

INTRODUCTION

In the past country reinforced concrete (RC) is the most successful building material. But the one drawback of the steel material is it does not exist with this material. Recently, textile reinforced concrete (TRC) in which steel is replaced with Glass fibre or Alkali matrix it gives the valuable option in consumption of concrete & weight of the structures. TRC offers the state of arts and give the freedom of design and size. TRC can made tailor also in the choice of binders and the textile as per our application. In the global scenario many TRC practical application Establish in western countries. Guidelines has been issued for the design and construction of TRC systems. It has been seen that the glass fibre and concrete can give the effective novel class of the TRC applications. Textile Reinforced Structure produces from carbon fibre represent an wonderful alternative, Reinforced material made from steel. TRC give us the same advantage as traditional reinforced concrete, but TRC gives some new opportunity as compared to RC. To produce textile reinforced, continuous fluces are processed in a planate structure by a textile technique to produce an optimal calibration and arrangement of fibre in structural

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members.TRC is a technique in which we produce thin concrete with an extremely high load capacity. It is an very auspicious alternative for repairing concrete structures. TRC is made from jute fibre grid structure which are mix in a fine grained concrete matrix ,since the reinforced material used in the TRC (Jute fibre) do not corrode under normal environment condition so no concrete cover is required for protect the reinforcement. TRC in concrete provide very high bond force as compared to concrete because jute textile reinforcement very larger surface area as compared to traditional reinforce steel bar .

EXPERIMENTAL PROGRAMME

a) Mix Design: Concrete mixture can be designed to provide a wide range of mechanical and durability properties to meet the design requirements of a structure. The specified design strength of concrete was 30MPa at 28 days. Ordinary Portland cement was used of PPC Grade. Coarse aggregate was used of 10mm size and steel fibres were used of 3 and 5% composition of volume. Jute fabric was used in single and double layers. According to the A/C method, the mix proportioning for concrete is shown in Table: 1

Table-1: Mix Proportion

Material	**Weight(kg/m^3)**
Cement	13.87 kg
Coarse Aggregate	37 kg
Sand	18.5 kg
Water	5.54 litres
W/C Ratio	0.4

b) Properties of Materials:

1. Concrete and steel reinforcement (RCC):

A concrete mix design with a target compressive strength of 30 Mpa was used to cast the RC beam specimen. In total, 6 standard cubes (150X150X150mm) were also cast which were tested under compression at 28 days. The average compressive strength of concrete at 28 days was 32 Mpa. To determine the actual characteristics of steel reinforcement, three samples of steel bars of 8mm diameter for one beam were tested under tension. The steel used is TMT 500 grade and also used a 20mm concrete cover and binding wire.

2. Steel Fibres (FRC):

Steel fibres are small, discrete reinforcement elements made from steel. The type of steel fiber used was straight steel fibers. There were two compositions of the volume of fibers used were 3% and 5% with respect to cement weight. The average fiber length was 30mm. The aspect ratio of steel fibers was 60.

Fig 1: Steel Fibres

3. Jute Fabric (TRC):

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Jute fabric can be used as a reinforcement material in concrete when jute fibers are embedded in concrete, they act as reinforcement. The type of Jute Reinforcement used was woven jute fabric. The length of jute fabric is 50 inches.

Fig 2: Jute Fabric

c) Casted Concrete Beams

Fig 3: Casting of beams

d) Test Setup:

The three cubes were tested for 7 days on a compression test machine. The average compressive strength was 22 Mpa. Remaining three cubes were tested for 28 days on a compression test machine. The average compressive strength was 32 Mpa. All the 18 beams were tested to failure in four-point loading system with dimension 500mmX100mmX100mm**.** The reading was taken at a regular interval of load. During loading, the specimen was visually inspected and cracks were marked. Pictures and videos were taken at a regular intervals to properly capture the crack pattern during testing.

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Fig 4: Compression Testing Machine

Fig 5: Flexure Testing Machine

e) Test Result and Discussion:

BEAM SPECIMEN	AVERAGE LOAD (KN)	MODULUS OF RUPTURE (Mpa)
Control Specimen	9.33	11.2
RCC	31.67	38
FRC (3%)	10	12
FRC (5%)	12.67	15.2
TRC (Single Layer)	6.33	7.6
TRC (Double Layer)	8.67	10.4

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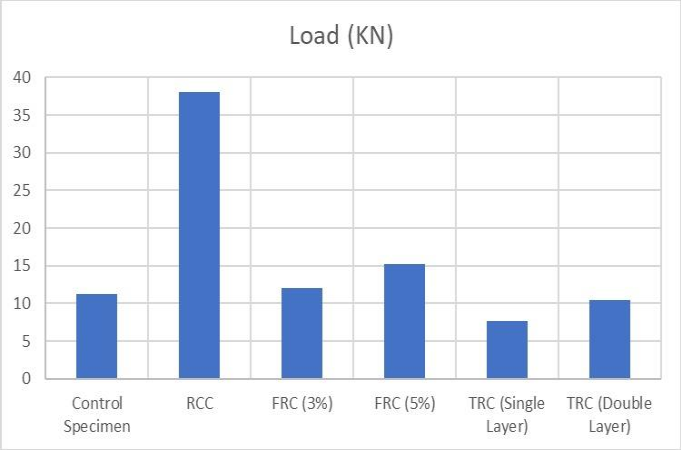

Fig 6 : Load Graph

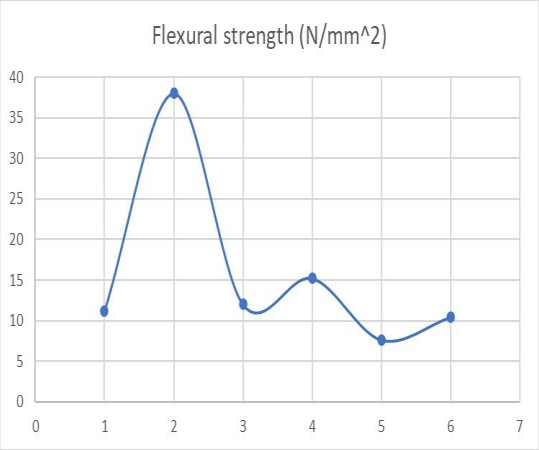

Fig 7: Flexural Strength Graph

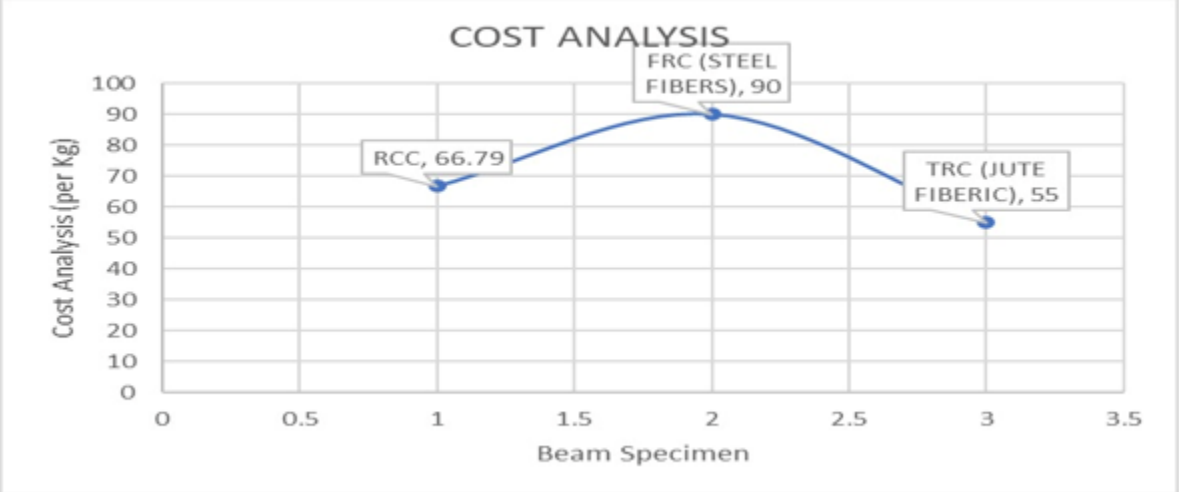

Fig 8 Cost Analysis Graph

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CONCLUSION

This paper presents an experimental investigation on RCC, FRC & TRC by evaluating the flexural strength through laboratory testing to determine their suitability for different structural applications. It conclude that the performance of reinforced cement concrete member has 239.29 % increase in flexural strength, fiber reinforced concrete has 47.33 % increase in flexural strength, textile reinforced concrete has 43.42 % increase in flexural strength.

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