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# An experimental investigation on properties of sisal fiber used in the concrete

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## Abstract

Fiber-reinforced concrete (FRC) is a concrete restrain fibrous material which increases its structural integrity. There are various types of fiber available like natural fiber, artificial fiber. The real contribution of the fiber is to increase the hardness of the concrete under any type of loading. Fiber-reinforced concrete is most familiar in India, but structural applications are very much limited. The FRC used for heavy-duty industrial floors. The fiber reinforced concrete is used in tunneling projects and for slope stabilization in India. To analyze the physical and mechanical properties of fiber mixed concrete by a lab test. In this project, the M30 concrete mix is used and the beam size used 1400 mm * 200 mm in size.

## Introduction

The sisal plant is exposed to extremes of heat and cold. When green agave sislana leaves are pounded, the plant's Fibers can easily be separated and used for weaving and sewing. The size of sisal fiber is 3 cm or 30 mm. Sisal fiber concrete based application such as Agricultural: Farm and animal storage structures, walls, silos, paving, etc. Commercial: Exterior and interior floors, polished concrete, slabs, parking areas, and roadways. Elevated Decks: Commercial and industrial composite steel deck construction and elevated formwork at airports, commercial buildings, shopping centers, etc.

Highways, Roadways, Conventional concrete paving, SCC, white-toppings, barrier rails, curb and gutter work, pervious concrete, sound attenuation barriers, etc. Mining & Tunneling, Ports & Airports, Precast Concrete & Products, Residential, Structural Reinforcement, Warehouse & Industrial, Waterways. The durability property of sisal fiber is more as compared to other natural fiber is one of the main reason for choosing sisal fiber in concrete (Fig. 1, Fig. 2, Fig. 3, Fig. 4).

Chemical composition of sisal fiber:The fine texture of sisal takes dyes easily and offers the largest range of dyed colors of all natural fibers. Zero pesticides or chemical fertilisers used in sisal agriculture. It is a stiff fiber traditionally used in making twine, rope and also dartboards sisal fiber is manufactured from the vascular tissue from the sisal plant (Agavesisalana). It is used in automotive friction parts (brakes, clutches), where it imparts green strength to performs, and for enhancing texture in coatings application.

## Section snippets

### Fiber extraction

Fiber is extract by a procedure known as decortications, where vegetation are compressed and compressed by a turning wheel set with rounded knives, so that only fibers stay put. In East Africa, where construction is normally on fat estates, the leaves are elated to a central decortications plant, where water is use to wash away the dissipate parts of the leaf. The fiber is then dried out, brushed and baled for sell overseas.

Sisal fiber reinforced cement composites were studied by K. Bilba, M.A. …

### Reason for choosing M30

- High early strength is available…
- High modulus of elasticity is available.…
- High durability…
- High abrasion resistance…
- Low permeability…

During the concrete element testing M20 will be taken in consideration for cylinders, cubes and sphere. But while considering beam of length (1400*200)mm M30 will be more compactable for tensile, ductility etc., for practice strength calculation (Table 1).

The M30 gives a good compressive strength at 3rd, 7th, 28th day as shown in Table 2. The size of the cube is…

## Experimentation

The experimental program contained three-beam groups [1], [2]. There is 4 no of beams are cast for the flexural test [7], [8]. There are many materials are needed for the casting of beam elements like cement, fine aggregate, coarse aggregate, admixtures, sisal fiber. The grade of cement is 53 grades. The brand of cement is Chettinad cement. The water-cement ratio is 0.42.the size of sisal fiber is 3 cm or 30 mm. The percentage of fiber is 1.5% is added in the concrete. The 1.5% of the fiber is…

## Result and discussions

The M30 fiber mixed concrete and conventional concrete are tested. The fiber mixed concrete gives an ultimate flexural strength more than conventional concrete. Further studies may be extended to M40 with the same fiber mixed concrete. Then compare M30 and M40 fiber reinforced concrete. The flexural strength may be varying from M30 and M40.…

## Conclusion

The applicability of fiber (sisal fiber) for the strengthening of concrete was investigated by various tests like a compressive strength test, flexural strengthening test. The fiber mixed concrete was increased the compressive strength of the cube. The sisal fiber reinforced concrete also improved the flexural strength of beam structural elements. So the fiber reinforced concrete is better than the ordinary conventional concrete. So it is increased the initial strength. The conventional…

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## References (8)

P.K. Chang *et al.*
A study on the hydration properties of high performance slag concrete analysed by SRA
Cem. Concr. Res. (2003)

T. Sen *et al.*
Flexural strengthening of RC beams using natural sisal and artificial carbon and glass fabric reinforced composite system
Sustain. Cities Soc. (2014)

R.D. TolêdoFilho *et al.*
Durability of alkali-sensitive sisal and coconut fibres in cement mortar composites
Cem. Concr. Compos. (2000)

D.G. Swift *et al.*

The flexural strength of cement-based composites using low modulus (sisal) fibres
Composites (1979)

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## Cited by (39)

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