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# TITLE: USE OF JUTE FIBER IN REINFORCEMENT CEMENT CONCRETE

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## Abstract

concrete is weak in tension and brittle character. concept of using fibers to improve the character of construction materials. Use of continuous reinforcement in concrete (reinforced concrete) increase strength and ductility, but requires careful placement and labor skill. Alternatively introduction fibers in discrete form in plane and reinforced concrete may provide better solution. When concrete cracks, and randomly oriented fibers start functioning, arrest cracks formation and propagation, and thus improve strength and ductility. potential application in many branches of engineering should be developed. In the present work the tensile, compressive, mechanical properties of jute fiber without modification and after modification with alkali and latex polymer has been modified by taking quantity of jute as 1% of cement. This modification of jute fiber improves tensile strength of Jute fiber also water absorption has been reduced. These properties are compared by taking tests on plain, with and without modification of jute fiber casting cube, cylinder and beams after curing of 7 days. From our project we had seen that there is considerable increase in strength of concrete by adding treated jute in concrete.

***keyword:*** *Treatment of jute fiber ,Use of jute in concrete, Effect of jute in concrete.*

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## 1. INTRODUCTION

It difficult to maintain strength of concrete and increase its durability, so addition of natural fibers is economical way to increase strength of concrete. type of fibers used include steel, glass, polymers, carbon and natural fibers. Economic considerations have restricted the use of carbon fibers in cementations composites on a commercial level for their non ecological performance. The Natural fibers have potential to be used as reinforcement over come the inherent deficiencies in cementations materials. Considerable researches are being done for use of reinforcing fibers like jute, bamboo, sisal, aware, coconut husk, sugarcane biogases in cement composites mostly in case of building materials. Use of natural fibers in a relatively brittle cement matrix has achieved strength, and toughness of the composite. The durability of fibers in a highly cement matrix must be taken into consideration by effective modifications. Specific chemical composition has chosen that can modify the fiber surface as well strengthen the cement composite.

## 2. MATERIALS AND METHADOLOGY

### 2.1 Materials

Pozzolona Portland cement of M40 Grade was supplied by Ultratech Cement Pvt. Ltd. Locally available coarse aggregate (stone chips of size 0 - 20 mm) and sand were used for composite fabrication as per IS:456 -2002.Jute fibers of TD4 grade were collected from Jute Mill, Indore, Nasik, India.

#### 2.1.1 Jute

India is one of the large jute producing country. Jute is an important best fiber with a number of advantages. The Jute has high specific properties , low density, less abrasive behavior to the processing equipment. good dimensional stability and harmlessness. Jute textile is a eco-friendly product and is abundantly available, easy to transport and has superior drivability and moisture retention capacity. It widely being used a natural choice for plant mulching and rural road pavement construction. The biodegradable and low jute products merge with the soil after using providing to the soil. Being made of cellulose, on combustion, jute does not generate toxic gases. Due to the jute low density combined with relatively stiff and strong behavior, the specific properties of jute.

**Fig no 1: jut**

**Table No 1: Mechanical properties of natural fibers as compared to conventional reinforcing fibers**

| Fiber | Density (g/cm3) | Elongation (%) | Tensile Strength (Mpa) | Young's Modulus (Gpa) |
|---|---|---|---|---|
| Jute | 1.3 | 1.5-1.8 | 393-773 | 26.5 |

**2.1.2 Cement**

Cement is material which generally use for bonding in concrete in construction industries. We used the Portland Pozzolan cement of 53 grades for our whole work. Before using some tests are carried on it. Some physical characteristics of cements are given in tables

### 2.1.3 Fine aggregate

The river sand was used as fine aggregate conforming to the requirement of IS 383:1970. The river was washed and screened, to eliminate unwanted deleterious material and over size particles. The test determination of specific gravity was carried out. surface dry aggregate were used for test. These properties of aggregate are necessary to decide proportions of the concrete mix.

**2.1.4 Course aggregate**

The coarse aggregate of 20mm from crushed ballast rock, conforming to IS 383:1970 were used. The aggregates were free from adherent coating, injurious amount of disintegrated pieces, alkali, vegetable matter and other deleterious substances. Care was taken that the aggregate do not contain high concentration of flaky, elongated shapes and organic impurities which might affect the strength or durability of concrete.

| Water | Cement | Sand | Coarse aggregate |
|---|---|---|---|
| 0.4 liter | 1 Kg | 1.44 Kg | 2.35 Kg |

**2.1.5 Concrete**

It a mixture of sand, cement, water, course an fine aggregate. We carried above tests on materials and above values concrete mix design is made and proportion is as follows. Admixture is use as per suitability of conditions.

**Table-2: Concrete mix design: Grade M40**

## 2.2 Methodology

### 2.2.1Problem statement

The properties of various fibers were identified and jute fiber is chosen as a natural fiber to replace by 1% weight of cement. And also it was treated with alkali and polymer latex such that the properties of jute fiber will change. And comparing in M40 grade plain cement concrete, raw jute cement concrete and modified jute cement concrete for compressive, split tensile and flexural strength.

### 2.2.2 Mixing process

The jute fiber reinforced concrete samples of mix design 1:1.44:2.35 (cement: sand: coarse aggregate, by weight) were fabricated by following process, for untreated and treated jute fiber reinforced concrete. Initially the chopped fibers of 6 cm length were immersed for 24 h in half of the total volume of water required for concrete preparation in a container. Next the half of the total amount of cement required was added to wet jute in that container with constant stirring to obtain jute-cement slurry. jute cement slurry was then slowly poured into a pan-mixer with stirring provision and the pan-mixer was run for 2 min. Sand and rest of cement was mixed with this jute-cement slurry. The remaining amount of water, sand and aggregate was then added and the pan-mixer was run for further 5 min. The fresh cement concrete thus obtained was cast immediately in molds and allowed to setting. All the specimens were demoded after 24 h of casting and water cured for 7 days respectively. At the specified date they were removed from water, surface dried and tested. Each test result represented the mean of at least three specimens.

### 2.2.3 Treatment on jute fiber

a) Treatment with alkali The jute fibers were cut to ~6 cm of length and soaked in 0.5% (w/v) NaOH solution at ambient temperature maintaining a fiber to liquor ratio of 1:30. The fibers were kept immersed in the alkali solution for 24 h. alkali treated fibers were then washed several times with distilled water to the remove excess alkali from fiber surface. The final pH was maintained at 7.0. The fibers were then air dried at room temperature for 24 h followed by oven drying at 55oC for 24 h.

b) Treatment with polymer latex commercially available aqueous emulsion of carboxylatedstyrene-butadiene

copolymer based polymer latex was used to modify the jute fibers. The solid content of undiluted polymer latex was found to be 41%. Alkali treated jute fibers were dipped into 0.5% (v/v) polymer latex for 24 h, maintaining a liquor ratio 1:30 at ambient condition. The fibers were then air dried at room temperature for 24 h followed by oven drying at 55°C for 24 h.

**Table-3: Test to be carried out on specimen for composite for 7 days**

| Sr. No. | Type of concrete composite | Test to be taken | Specimen | | |
|---|---|---|---|---|---|
| | | | Cube | Cylinder | Beam |
| 1 | Plain cement concrete | Compression, tension | 3 | 3 | 3 |
| 2 | Raw jute cement concrete | Compression, tension | 3 | 3 | 3 |
| 3 | Treated jute cement concrete | Compression, tension | 3 | 3 | 3 |

## 3. RESULTS AND DISCUSSION

Generally we taken compressive, split tensile and flexural strength on members. While the different tests are carried on cement, fine aggregate and course aggregate. The split tensile strength where obtain by following formula

Tensile strength = (load at break) / (original width) (original thickness)

**Table-4: Result**

| Mixture | Avg. Compressive strength(Mpa) | Avg. Split tensile strength(Mpa) | Load carried by beam in single point load test (KN) |
|---|---|---|---|
| Plain cement concrete | 23.52 | 3.92 | 214.75 |
| Raw jute cement concrete | 27.53 | 4.22 | 216.79 |
| Treated jute cement concrete | 29.77 | 4.29 | 223.4 |

**Result takes from table**

1. From the table, it is observed that the compressive strength of concrete is increased by 17.5% by adding raw jute and 26.5% by adding modified jute in concrete.
2. From the table it is observed that the split tensile strength of concrete is increased by 7% by adding raw jute and 9% by adding modified jute in concrete.
3. From the table it is observed that the flexural strength of concrete is increased by 1% by adding raw jute and 4% by adding modified jute in concrete.

## 4. CONCLUSIONS

1. It was observed that when the jute is chemically treated then its degradation decreases
2. It was observed that when the raw jute is added in concrete by 1% weight of cement then the compressive strength of concrete cube increased by 17.5% and by adding modified jute compressive strength increase by 26.5%
3. It was observed that when the raw jute is added in concrete by 1% weight of cement then the split tensile strength of concrete cylinder increased by 7% and by adding modified jute split tensile strength increase by 9%
4. It was observed that when the raw jute is added in concrete by 1% weight of cement then the flexural strength of concrete cube increased by 1% and by adding modified jute flexural strength increase by 4%.
5. Hence, it is proved that modified replacement proportion is beneficial to use in practice as it gives workable concrete with more compressive, flexural and tensile strength
6. It was observed that it is difficult to mix or spread jute in concrete also it is difficult to maintain water cement ration

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