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An Experimental Study on Structural Behavior of Concrete Beam Using Sugarcane Bagasse Fibre

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ABSTRACT
Natural fibers are frequently used in construction in building materials engineering. However, using wastesugarcane bagasse fiber as a natural building material is extremely valuable because it can improve crack control and make brittle concrete more ductile. Additionally, sugarcane construction can help reduce environmental pollution. A mixture of sugarcane fiber will be used in this study to test whether the compressive, flexural, and tensile strengths of lightweight concrete and M25 grade concrete differ. Also, the ideal sugarcane bagasse fiber in the substantial combination where the level of 0.5%, 1.0%, 1.5% and 2%. The specimens of hardened concrete were tested on days 7, 28, and 29 following the curing test. Thispercentage achieves a value of compressive strength that is comparable to that of concrete control, a value of tensile strength that is higher than that of concrete control, and a timing of concrete cracking that is becoming more sluggish.

I. INTRODUCTION
In India practically all the Structural Designing developments are done utilizing squashed stone total as it was accessible in bounty. Because of weighty expansion in the development exercises, the squashed rock stone which are the traditional coarse total is under consumption and furthermore, presently a-days an intense deficiency of these materials is capable. Additionally, it is proving to be unprofitable because these aggregates must be transported from a faraway location. The issue of air pollution brought on by crushing plants is yet another significant drawback of these aggregate. As a result, alternatives to crushed granite stone must be investigated. Even though river stone has a lot of potential as a natural aggregate, it is rarely used in concrete. Concrete is comprised of three fundamental fixings which is concrete, sand, totals and water. Notwithstanding, there were

Additionally different materials placed into the substantial blend which is known as habit- forming to expand the strength of the substantial. Concrete is the most broadly utilized development material. It has replaced masonry made of stone and brick due to its ability to be cast in any shape. Plain concrete is feeble in pressure and has restricted flexibility and little protection from breaking. Concrete has long been known for its high compressive strength at a low cost. Concrete has a high compressive strength, but its tensile strength is only 10% of its compressivestrength, making it quite brittle. The majority of concrete structures typically endure temperatures that are no higher than those imposed by the surrounding environment. Additionally, the optimal volume of sugarcane fiber in the concrete mixture was 0.5 percent, 1.0 percent, and 1.5 percent, respectively. After the curing test was completed, compressive strength was tested on days 7 and 28. In the meantime, only after 28 days of curing has the tensile test been performed to measure the tensile strength of sugarcane fiber relationships in concrete mixes. Aftereffect of the testing showed that the ideal worth containing admixtures of sugarcane is 0.5%. As a result, sugarcane fiber can be added to the concrete mixture in amounts not exceeding 0.5 percent. For normal or lightweight concrete, the optimal percentage that results in the highest compressive strength is 0.5 percent, which is comparable to the strength of concrete control. When the volume of sugarcane fiber was increased, the tensile strength of the concrete increased, particularly for normal concrete, where the 1.5% volume of

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sugarcane is the highest compared to the tensile strength of the control concrete. However, the lightweight with sugarcane fiber has a maximum tensile strength of 0.5%. At the point when the sugarcane fiber continue to build, the elasticity of the lightweight cement was diminished.

II. MATERIALS AND ITS PROPERTIES

Materials used for the experiment includes ordinary Portland cement of grade 53, fine aggregate, coarse aggregate and Sugarcane bagasse fibre.

I. Cement

53 grades ordinary Portland cement (OPC) was used for the study programmer. The cement properties are given. All properties of cement are tested by referring IS 12269-1987 specification. The properties of the cement istabulated in table 1.1

II. Coarse aggregate

Crushed rubble stone aggregate was used. The aggregate used were 12mm and downgraded conforming BIS: 383 – 1970. The properties of coarse aggregate as observed from the laboratory tests are presented in Table 1.2

III. Fine aggregate

M sand of size below 4.75mm conforming to zone II of IS 383-1970 was used as fine aggregate. The properties of fine aggregate as observed from the laboratory tests are presented in Table 1.3

IV. Sugarcane bagasse fibre

The Sugarcane bagasse fiber are collected from the nearby Industry in Arachalor. The collected Sugarcane bagasse fibre are cleaned and dried for more than two days. The Sugarcane bagasse cut to used fibre in 50 mm. The Sugarcane baggase fibre specific gravity is 1.6. The properties of the Sugarcane bagassefibre is tabulated in table 1.4

Table1.1: Properties of cement.

Sl. No	Physical properties	Values
1.	Specific gravity	3.15
2.	Initial setting time	38 minutes
3.	Final setting time	410 minutes

Table 1.2: Properties of Coarse Aggregate.

SI.no	Physical properties	Values
1.	Specific gravity	2.90
2.	Fineness modulus	3.15
3.	Water absorption	0.68
4.	Impact value	59.45%

Table 1.3: Properties of Fine Aggregate.

Sl.no	Physical properties	Values
1.	Specific gravity	2.67
2.	Water absorption	0.60%

Table 1.4 & 1.5: Properties of Polypropylene fibre

Physical properties:

Sl.no	Physical properties	Values
1.	Diameter	10-34
2.	Length	0.8-2.8
3.	Aspect ratio (L/D)	76
4.	Moisture content	49

Mechanical properties:

Sl.no	Physical properties	Values
1.	Tensile strength	1820
2.	Young's Modulus	15
3.	Failure strain	4
4.	Density	270

MIXTURE PROPORTION ANDTEST PREPARATION

a. Mix design proportion

The desired properties of concrete can be obtained by using the ingredients in a certain proportion and determining the relative amount of material is known as mix design. Thus mix design is defined as the process of selecting suitable ingredients of concrete anddetermining their relative quantities for producing the concrete of desired properties as economically as possible. The object of mix design is to decide the proportions of materials, which will produce concrete having the required desirable properties. The mix proportions should be selected in such a way that the resulting concrete is of desired workability while fresh and it could be placed and compacted easily for the

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intended purpose.

b. Workability test

The mould for the slump test is a frustum of a cone, 300mm of height. The base is 200mm in diameter and it has a smaller opening at the top of 100mm.The base is placed on a smooth surface and the container is filled with concrete in three layers, whose workability istested.

c. Compressive Strength

For cube compression tests, concrete cube size of 150mm was employed. The test was conducted as per IS 516-1959 provision. Compressive strength can be measured by plotting applied force against deformation in testing machine, such as a universal testing machine. The compressive strength of cube for various proportional like0%, 0.5%,1%,1.5% and 2% are tabulated in table

d. Flexural Strength

The The flexural test is one measure of the tensile strength of concrete. It is a measure of an unreinforced concrete to resist failure in bending. The specimen is placed symmetrically on the load-applying and support blocks. In the present test, the distance between the support-block axis and the extremity of thespecimen is 50 mm .The load is then rapidly applied until approximately 50 percent of the breaking load hasbeen reached. Flexural strength =**$M/Z=WI/bh^2$**

e. Split Tensile Strength

The test was as per IS 5816-1999 code provision. The split tensile strength is one of the basic and tensile stresses are likely to develop in concrete due to drying shrinkage, temperature gradients and many other reasons. Therefore, the knowledge of tensile strength of concrete is of importance. This specimen was laid horizontally in the compression testing machine with the cast forces in contact with plates of the testing machine. The load was applied at a uniform rate until the sample fails. The load was noted at a failure.

TEST RESULTS

a. Compressive strength results:

The test results are tabulated below 1.6

% of Admixture	7^{th} Day Strength	28^{th} Day Strength
0	16.53	31.6
0.5	17.56	33.7
1	18.6	34.8
1.5	15.7	28.2
2	14.6	25.3

b. Flexural Strength:

The test results are tabulated below in 1.7

% of Admixture	7^{th} Day Strength	28^{th} Day Strength
0	2.83	3.93

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0.5	2.93	4.06
1	3.01	4.13
1.5	2.77	3.72
2	2.67	3.52

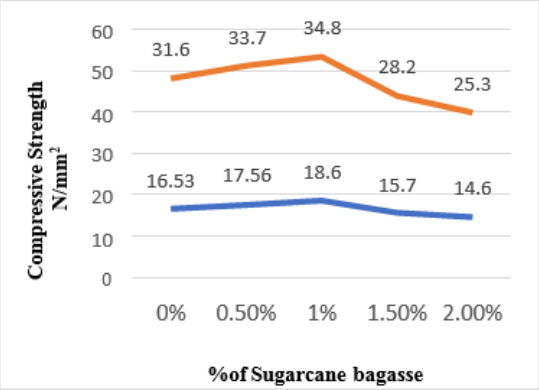
c. Split Tensile Strength of Concrete:

The test results are tabulated below in 1.8

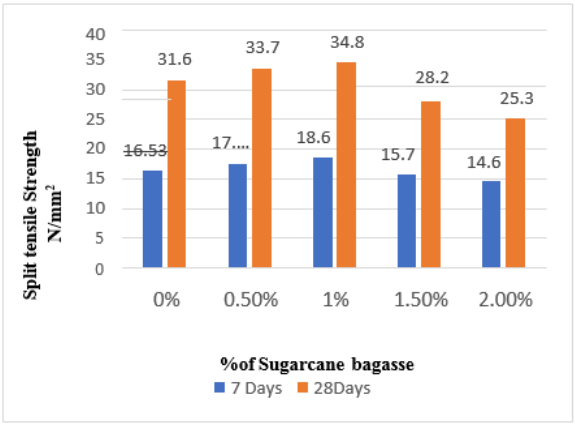
% of Admixture	7th Day Strength	28th Day Strength
0	1.94	3.5
0.5	2.3	4.1
1	2.6	4.7
1.5	1.76	3.0
2	1.3	2.7

COMPARISON OF SPECIMENS

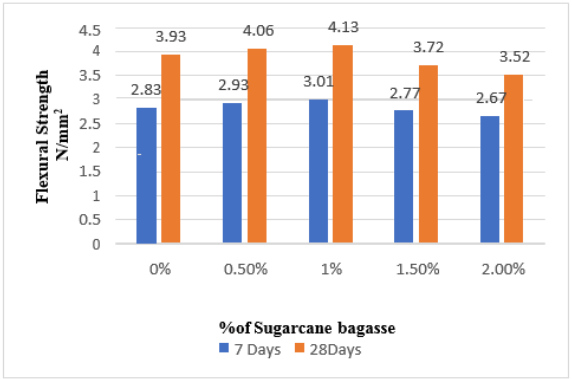
The various aspects such as compressive strength, flexural strength and split tensile strength are represented below, the differences between the resultant concrete and the conventional concrete is produced clearly:



Compressive strength of concrete



Split tensile strength of concrete



Flexural strength of concrete

III. DISCUSSION

The load is then applied on a smooth surface on the cube steadily and uniform starting from zero at a rate of 35 N/mm^2/min till the cube fails. In compressive strength value is increased at **1%** of adding Sugarcane bagasse fibre in concrete when compressed to other percentage of Sugarcane bagasse concrete. The tensile strength of concrete may be obtained by split tensile strength of cement affords quicker indication of defects in the cement than any other test. The entire cylinder was tested using standard compression testing machine of 2000KN capacity. Used for measuring modulus of rupture. Important test for road and airport concrete pavement. The flexural strength of cement for various proportions like 0%,0.5%,1%,1.5% and 2%. The flexural test is one measure of the tensile strength of concrete. It is a measure of an unreinforced concrete to resist failure inbending.

IV. CONCLUSION

Based on the analysis of data and discussion that has been carried out, it was shown that concrete containing sugarcane fibers in consistent with the properties of ordinary and light weight concrete. Use of sugarcane bagasse fibre in cement concrete can help in waste reduction in pollution. The need of the hour is to encourage such a use of the wastes of construction material in low cost. Compressive strength of the concrete were decreased when the amount of sugarcane fiber increased. The mechanical properties test of concrete done gives the clear view on the effect of sugarcane bagasse on the strength of concrete. The optimum percentage that give the higher compressive strength is 1% However, optimum tensile strength of the lightweight with sugarcane fibre is 1 %. When the sugarcane fibre keep increasing, the strength of the lightweight concrete was reduced. After added with sugarcane bagasse, the setting time of concrete have been extended for several hours depending on the amount of sugarcane bagasse added.

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