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A Comparative Study of the Use of Concrete Mix Using Jute Fibers

Ravikant Kumar[1], Rahul Sharma[2]
[1]*M.Tech Scholar, Civil Department, Radharaman Engineering college, Bhopal, India*
[2]*Assistant Professor, Civil Engineering Department, Radharaman Engineering College, Bhopal, India,*

Abstract: ***The character of fiber reinforced concrete can be changed by the variation of certain factors. these factors are the geometric configuration of fibers, type and. quantity of fibers, , dispersal, direction, and concentration of the fibres***
Portland cement concrete is assumed to be a relatively. Brittle material .When non-reinforced concrete is exposed to tensile stresses. This is likely to fracture and fail. Since the start of the nineteenth century, studies were conducted. to reinforce concrete by using fibres. After the reinforcement of concrete by fibers, it becomes a composite group in which the fibres endures the tensile stresses. When concrete is reinforced by. using fiber in the mixture, it further increases the tensile strength of the composite system. Research has revealed that. The strength of concrete may be improved greatly by the adding of fibers
Keywords: Fiber, jute fibres, NDT Mix design, design mix

I. INTRODUCTION

When concrete is reinforced by. using fiber in the mixture, it further increases the tensile strength of the composite system. Research has revealed that. The strength of concrete may be improved greatly by the adding of fibers. As the stretching ability of the concrete under load of reinforcing fiber is more than plain concrete, initially the composite system. will function as un-reinforced concrete. However, with extra loading the fiber reinforcing will be activated, too. hold the concrete mix together.
Concrete is used as a main material in construction industry as component. We know concrete is weak in tension so it should be reinforced with different types of Fibers. this will increase the tensile strength of concrete and make concrete strong, durable and less susceptible to tension. Jute fiber is an agricultural material and cause many environmental troubles in its disposal and storage. So it can also use as fiber in concrete which results in an advantage to be used in our study.

II. EASE OF USE

Concrete is a composite material composed of coarse aggregate bonded together with a fluid cement that hardens over time. The concretes we use are majorily lime-based concretes. These are Portland cement concrete or concretes made with other hydraulic cements. But asphalt concrete, is also a type of concrete, where the cement material is bitumen. When coarse and fine aggregates are mixed with dry Portland cement and water, the mixture forms a fluid that is easily poured and molded into shape. Cement reacts chemically with water and other ingredients to form a hard substance which binds the supplies together into a durable stone-like material.. admixtures (such as pozzolans or superplasticizers) are included in the mixture to improve the properties of the finished material. concrete is poured with reinforcing materials (such as rebar) implanted to offer tensile strength yielding reinforced concrete The Famous concrete structures contain the Hoover Dam, Roman Pantheon and the Panama Canal. The ancient Romans were earliest large-scale users of concrete technology . concrete was widely used in the Roman Empire. The Colosseum in Rome was built of concrete.

A. Fibers

Concrete is the composition of basic ingredients, cement, sand, aggregate and water. Admixtures and reinforcements are used with concrete to get the desired physical properties. When these elements are combined together, they constitute a liquid volume that is easily mounded into required form. When cement comes in contact with water, it start exothermic reaction which forms a solid matrix and binds with the rest of the elements together into a durable rock-similar fabric, which holds many functions.

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III. METHODOLOGY

This chapter deals with material used in this project and also method adopted for this project. Properties of material which is used.in this.project is described along with methodology, chapter start with material used and goes on to the mix design, which is done as.per IS 10262 : 2009, then mixing, casting, compaction and curing details is given.

A. Cement

Ordinary Portland cement of grade 43 is used in this project, conforming to specification given under IS 8112: 1989 . cement which is used in this project.is tested in laboratory and their result is given in.table.

S. No.	Property	Value
1	Fineness	97%
2	Initial Setting Time	47 mins
3	Final Setting Time	326 mins
4	Specific Gravity	3.16
5	Soundness	3.4 mm
6	Avg Compressive Strength	7 Days – 29.3 MPa
		14 Days – 33.2 MPa
		28 Days – 43.6 MPa

B. Mixing

In this project hand mixing is preferred, The mix of the materials, including water, cement, aggregates and e-waste is mixed by weighted, The quantity of cement, aggregate, e-waste and water for each batch shall be determine by weight, to an accuracy of 0.1% of the total weight of the batch. The concrete shall be mixed by hand or preferably in a laboratory batch mixer, in such a manner as to avoid loss of water or other materials. For hand mixing the concrete batch shall be mixed on a water tight, non-absorbent platform with a shovel, trowel or similar suitable implement, procedure adopted for mixing is, cement and fine aggregate shall be mixed dry until the mix give uniform color. coarse aggregated is added and mixed with the cement and fine aggregate until the coarse aggregate is uniformly distributed throughout the batch, and then water is added and the entire batch mixed .until the concrete .appears to be homogeneous and has the desired consistency.

C. Compaction

In this project as per IS: 516:1959 compaction is done, the test specimen shall be .made as soon as practicable after mixing and in such a way as to produce full .compaction of the concrete with neither segregation nor excessive laitance. The concrete shall be filled in to the mould in layers approximately 5cm deep. the scoop. shall be moved around the top edge of the mould as the concrete slides from it, in order to insure a symmetrical distribution of the.concrete within the mould. After the top layer has been compacted, the surface of the concrete shall.be finished level with the top of the mould.

Use a trowel for this , and covere it with.a glass or a metal plate to prevent evaporation. When compacting is done the standard tamping bar shall be used.

IV. TEST & RESULTS

A. General

This section gives results and discussion of various experimental tests performed on concrete prepared with different fibers. The major property of concrete which governs its application in real life is its compressive strength. The concrete is required to have enough compressive strength so that it could efficiently support all the loads acting on it throughout the entire life of structure. In present scenario, there is a growing interest in non-destructive testing of material. Hence, in this dissertation, compressive strength of concrete is calculated through both conventional method of cube testing and rebound hammer test. A comparison of results obtained from both methods is also done to check reliability of test results obtained from rebound hammer test.

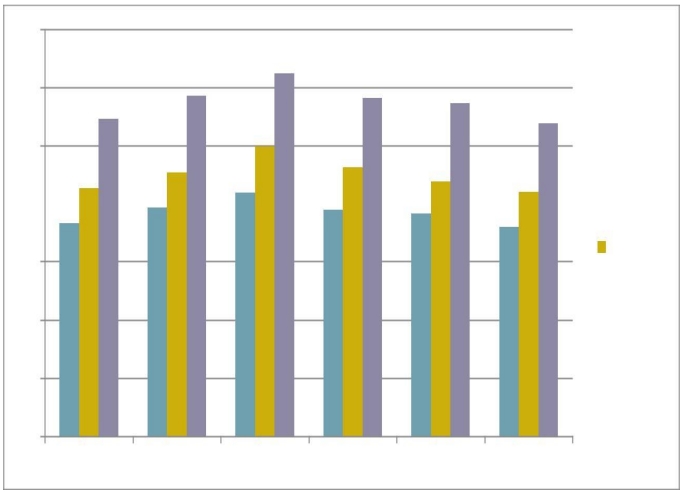
B. Slump Test

The slump test result is a slump of the behavior of a compacted inverted cone of.concrete under the action. of gravity. It measures the consistency or the wetness of concrete. This test is performed. to check the consistency of freshly made concrete. Consistency is a term very closely related to workability. It is a term which describes. the state of fresh concrete. It refers to the ease with which. the concrete flows. It is used to indicate. the degree of wetness. The slump is termed as true slump, shear slump. and collapse slump. If a shear or collapse slump is achieved, a fresh sample should. be taken and the test repeated. A collapse slump is an. indication of too wet a mix. Only a true slump is of any. use in the test.

Table Results from rebound hammer test for Jute fiber

s. no.	Mix name	Jute fibre %	Average Compressive Strength (Mpa)		
			7 days	14 days	28 days
1	JT	0	18.30	21.35	27.32
2	JT1	0.5	19.63	22.69	29.30
3	JT2	1.0	20.91	24.9	31.20
4	JT3	1.5	19.50	23.1	29.10
5	JT4	2.0	19.18	21.9	28.63
6	JT5	2.5	18.03	21.01	26.90

Graph : Results from rebound hammer test for Jute fiber



C. Compressive Strength Test

In addition to compressive strength from rebound hammer, the compressive strength is also obtained from testing of cubes by crushing them in compression testing machine. Tabe7 and table 8 shows compressive strength results and. it has been observed. that like wise rebound hammer test, compressive strength also gives results in same pattern, but compressive strength test by crushing strength machine give higher value than rebound hammer test.

Table : compressive strength test result obtained from cube testing for Jute Fiber

s. no.	Mix name	Jute fibre %	Average Compressive Strength (Mpa)		
			7 days	14 days	28 days
1	JT	0	18.92	21.92	28.12
2	JT1	0.5	20.06	23.69	29.90
3	JT2	1.0	21.51	25.38	32.20
4	JT3	1.5	19.92	23.4	29.30
5	JT4	2.0	19.38	22.9	28.90
6	JT5	2.5	18.82	22.01	27.90

Graph: compressive strength test result obtained from cube testing for Jute Fiber

D. Slump Cone Test

The slump test results are obtained by testing the concrete in slump test apparatus. The slump test result for for jute fiber based concrete is shown in Table and graph

Table : Slump test results for jute fiber

s. no.	Mix name	Jute fibre %	Slump in mm
1	JT	0	95
2	JT1	0.5	89
3	JT2	1.0	82
4	JT3	1.5	75
5	JT4	2.0	72
6	JT5	2.5	65

V. CONCLUSIONS

The addition of jute fibres increase the compressive strength of the concrete cubes upto a certain limit and then it decreses The optimum percentage of the jute fibres to be reinforces is 1%

1) The results from the conventional method also matches with the non conventional method. Although conventional method gave more value

2) The slump decreses with the addition of the reinforced fibres.

3) Split tensile strength also follow the same trend as the compressive strength . it increases till the optimum 1% of the fibres percentage and then decreses.

4) A future study can be done using these data with other natural and synthetic fibres and can be obtained their optimum replacement percentage as well

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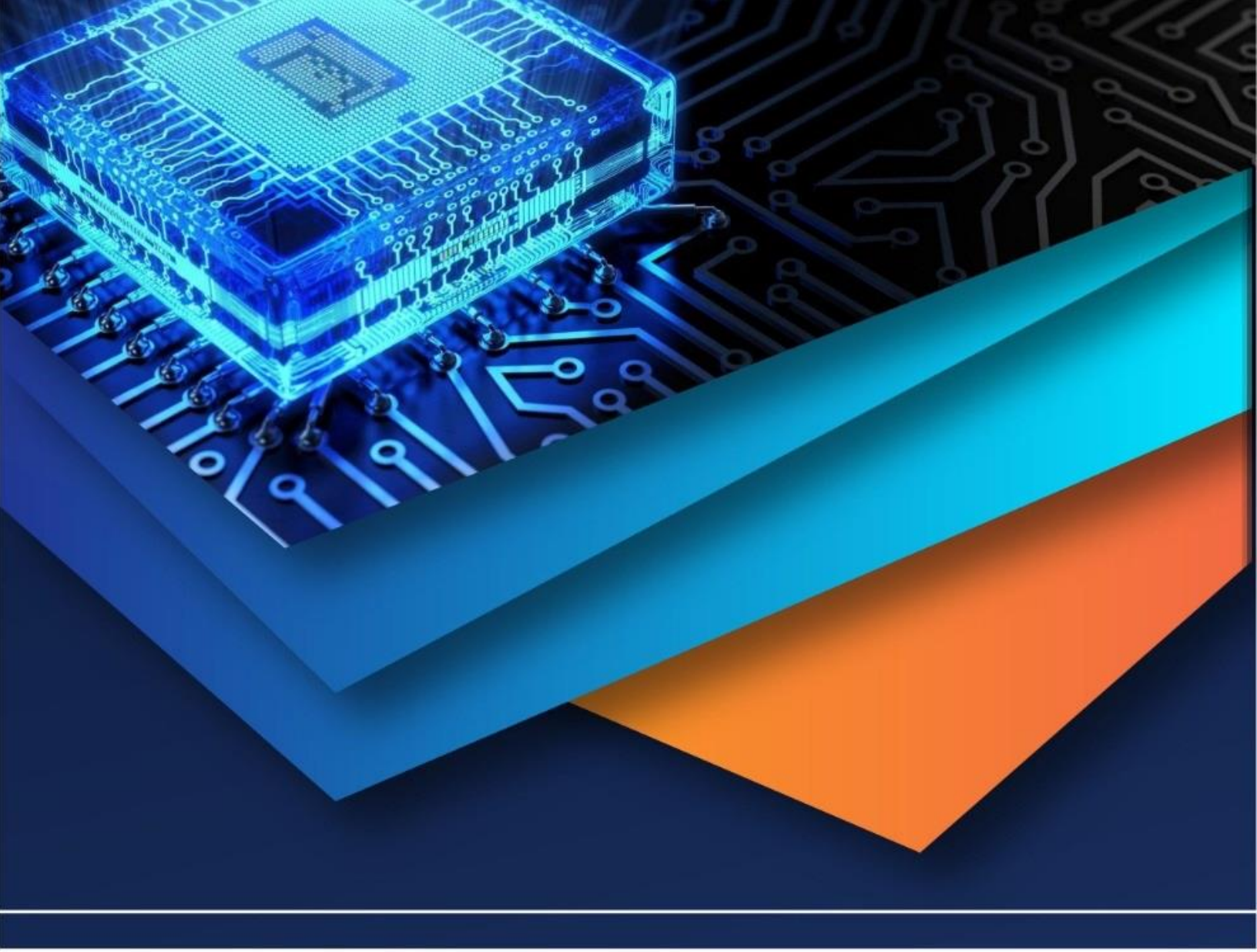

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