iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** VIII **Month of publication:** August 2019

DOI: http://doi.org/10.22214/ijraset.2019.8052

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue VIII, Aug 2019- Available at www.ijraset.com

Experimental Study of Jute Fibre Concrete with Admixture

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Abstract: ***Jute fiber is a characteristic fiber, which has many favorable position in development work. As concrete is feeble in pressure and it has weak character. The idea of using fibers to improve the qualities of improvement materials is old. As India is probably the biggest producer of jute[1].Therefore,it has a wide scope of utilization in numerous parts of structuresto be built up. Theaddition of jute fiber improves the properties of concrete. In this work the concrete cubes were prepared with different percentage of jute fibers is that 0.5%, 0.75%, 1% with super plasticizer. The compressive strength of concrete is determined at7 days, 14 days,28days. It is absorbed that compressive strength of concrete increases with the increase in the percentage of jute fibers.***

Keywords: Jute Fibre, Admixture, compressive strength, Initial and final setting time.

I. INTRODUCTION

It is difficult to maintain strength of concrete and increase its durability, so addition of natural fibers is economical way to increase strength of concrete. Many varieties of fibres used in concrete include, polymers, glass, carbon, steel and natural fibers.

Fiber added in concrete and mortar have proved to improve the various engineering properties of the basic materials, such as impact, toughness, thermal shock, spalling, flexural strength and resistance to fatigue Chandar [1] in his investigation concluded that compressive strength , tensile strength of concrete containing jute fibre is higher than the concrete containing steel fibre. In this experimental program both compressive strength of plain concrete and jute fiber reinforced concrete with and without super plasticizer were investigated it was found.

Table1. Properties of jute fibre

S.No.	Physical Properties	Results
	Fiber type	Hemp
1.	Specific gravity	1.29
2.	Aspect Ratio	50
3.	Length	40 mm
4.	Diameter	0.8mm

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A. Cement

Ordinary Portland cement (OPC) of 43 grade conforming to IS 8112. The cement is available in local markets. The weight of the one bag of cement is 50 kg.Brand Name: Ultra Tech

Table2. Properties of cement

S. No.	Physical properties	Results
1	Cement type	OPC 43
2	Specific gravity	3.14
3	Fineness	5.26 %
4	Final Setting Time	210 Minutes
5	Standard Consistency	33 %
6	Initial Setting Time	55 Minutes

B. Coarse Aggregate

Coarse aggregate taken from the local quarry The maximum nominal size ofaggregate was 20 mm, specific gravity of coarse aggregate was 2.85. The tests are performedon coarse aggregate according to IS 2386-1963.fineness Modulus of coarse aggregate was 6.91

C. Fine Aggregate

Locally available sandpassing through 4.75mm sieve wasutilized and it has a specific gravity of 2.67. The evaluating zone of fine aggregate is Zone II. Physical properties of fine aggregate investigated as per IS 383-1970.fineness Modulus of fine aggregate was 2.87

D. Super Plasticizers

ConplastSp 430
Brand Name: Fosroc Chemicals India pvt.ltd.

Table3. Properties of super plasticizer (https://www.fosroc.com)

S.No.	Physical Properties	Results
1	Superplasticizer type	Conplast SP 430
2	Chloride content	Nil
3	Specific gravity	1.225 at 30^0C
4.	Air entrainment	Approx 1 % additional air is entrained

II. METHODOLOGY

The plain concrete and jute fiber reinforced concrete samples of were prepared by following process for 0.5 %,0.75% and 1% jute fiber of total mass of concrete. The jute fiberswere cut in the lengths of 4cm and separated manually by hand. The jute fibers are added in the concrete mixer gradually during the mixing operation The green cement concrete obtained was immediately filled in molds in three layers , each layer was compacted. The cubes were given proper vibration on vibtration table and allowed to set for 24 hours. All the specimens were removed from moulds after 24 h. Samples were cured for 7days, 14days, 28 days respectively.Concrete cubes were removed from water and tested.

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III. RESULTS

A. *Compressive Strength Test*

This test is performed by the compression testing machine and the compressive quality of concrete cubes wereobtained at the period of 7 days, 14 days, and 28 days. The results of the tests are given in table4, table5, table6, table7, table8.

Table4. Compressive strength of Plain Concrete with 0 % fibres

Days	Sample Designation	Compressive strength (MPa)	Average Compressive strength (MPa)
7 days	PS1	34.43	32.75
	PS2	33.33	
	PS3	30.50	
14 days	PS1	38.5	38.05
	PS2	40.22	
	PS3	35.44	
28 days	PS1	41.32	40.04
	PS2	38.57	
	PS3	40.24	

Table5. Compressive strength of Concrete with Superplasticizer with 0% fiber

Days	Sample Designation	Compressive strength (MPa)	Average Compressive strength (MPa)
7 days	SS1	38.11	36.64
	SS2	35.42	
	SS3	36.41	
14 days	SS1	37.33	38.73
	SS2	40.19	
	SS3	38.67	
28 days	SS1	41.14	41.55
	SS2	40.31	
	SS3	43.22	

Table6 compressive strength of Concrete with differentJUTE fibre percentages

Compressive strength (MPa)									
Days	0.5 % Jute Fiber			0.75% Jute fiber			1 % Jute fiber		
	Sample Designation		Average Compressive strength (MPa)	Sample Designation		Average Compressive strength (MPa)	Sample Designation		Average Compressive strength (MPa)
7 days	JS11	39.29	39.55	JS21	41.22	42.41	JS31	42.44	43.92
	JS12	40.41		JS22	42.74		JS32	43.57	
	JS13	38.95		JS23	43.27		JS33	45.76	
14 days	JS11	41.27	43.05	JS21	45.55	45.36	JS31	47.81	47.51
	JS12	43.31		JS22	44.33		JS32	46.53	
	JS13	44.13		JS23	46.21		JS33	48.21	
28 days	JS11	45.25	47.03	JS21	47.94	48.42	JS31	51..69	51.50
	JS12	47.23		JS22	48.54		JS32	50.55	
	JS13	48.61		JS23	48.78		JS33	52.28	

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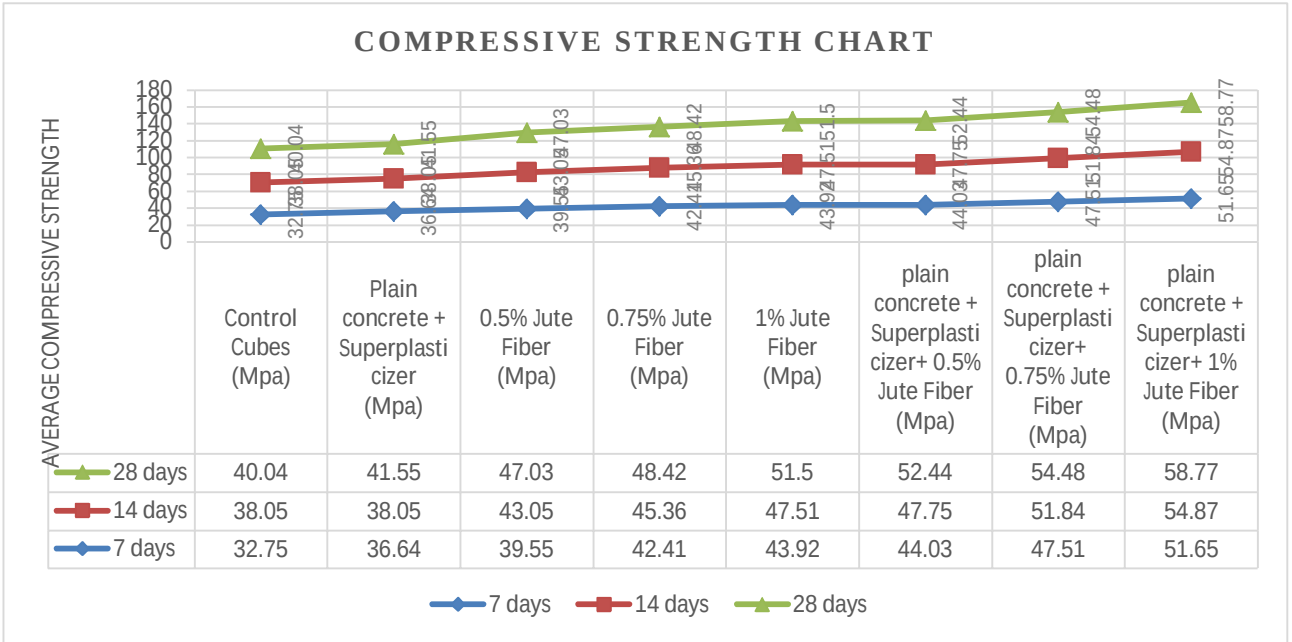
Table7 compressive strength of Concrete withSuperplastisizer and different jute fibre percentages

Compressive strength (MPa)									
Days	Superplasticizer + 0.5 % JUTE Fiber			Superplasticizer + 0.75% JUTE fiber			Superplasticizer + 1% JUTE fiber		
	Sample Designation		Average Compressive strength (MPa)	Sample Designation		Average Compressive strength (MPa)	Sample Designation		Average Compressive strength (MPa)
7 days	JSS11	40.11	44.03	JSS21	44.39	47.51	JSS31	48.42	51.65
	JSS12	43.66		JSS22	47.48		JSS32	51.11	
	JSS13	48.32		JSS23	50.67		JSS33	55.42	
14 days	JSS11	44.21	47.75	JSS21	49.78	51.84	JSS31	51.77	54.87
	JSS12	48.75		JSS22	51.33		JSS32	54.23	
	JSS13	50.30		JSS23	54.41		JSS33	58.61	
28 days	JSS11	53.88	52.44	JSS21	50.21	54.48	JSS31	57.85	58.77
	JSS12	50.55		JSS22	55.87		JSS32	59.77	
	JSS13	52.89		JSS23	57.38		JSS33	58.69	

Table8 Average compressive strength variation of various samples at 28 days

Average Compressive strength								
Days	Average strength of plain concrete with 0 % fibres (Mpa)	Average Compressive strength of plain concrete with Superplasticizer and 0% fiber (Mpa)	Average compressive strength of concrete with different fibre percentages (Mpa)			Average compressive strength of concrete with Superplastisizer and different fibre percentages (Mpa)		
			0.5 % Jute Fiber	0.75% Jute fiber	1 % Jute fiber	Superplasticizer and 0.5 % Jute Fiber	Superplasticizer and 0.75% Jute fiber	Superplasticizer and 1% Jute fiber
28 days	40.04	41.55	47.03	48.42	51.50	52.44	54.48	58.77



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IV. CONCLUSION

In this present investigation the following conclusions could be drawn.

A. It is found that compressive strength of concrete increases with the increase in the percentage of jute fibre.
B. The addition of superplasticizer further increases the compressive strength of concrete embedded with jute fibre.

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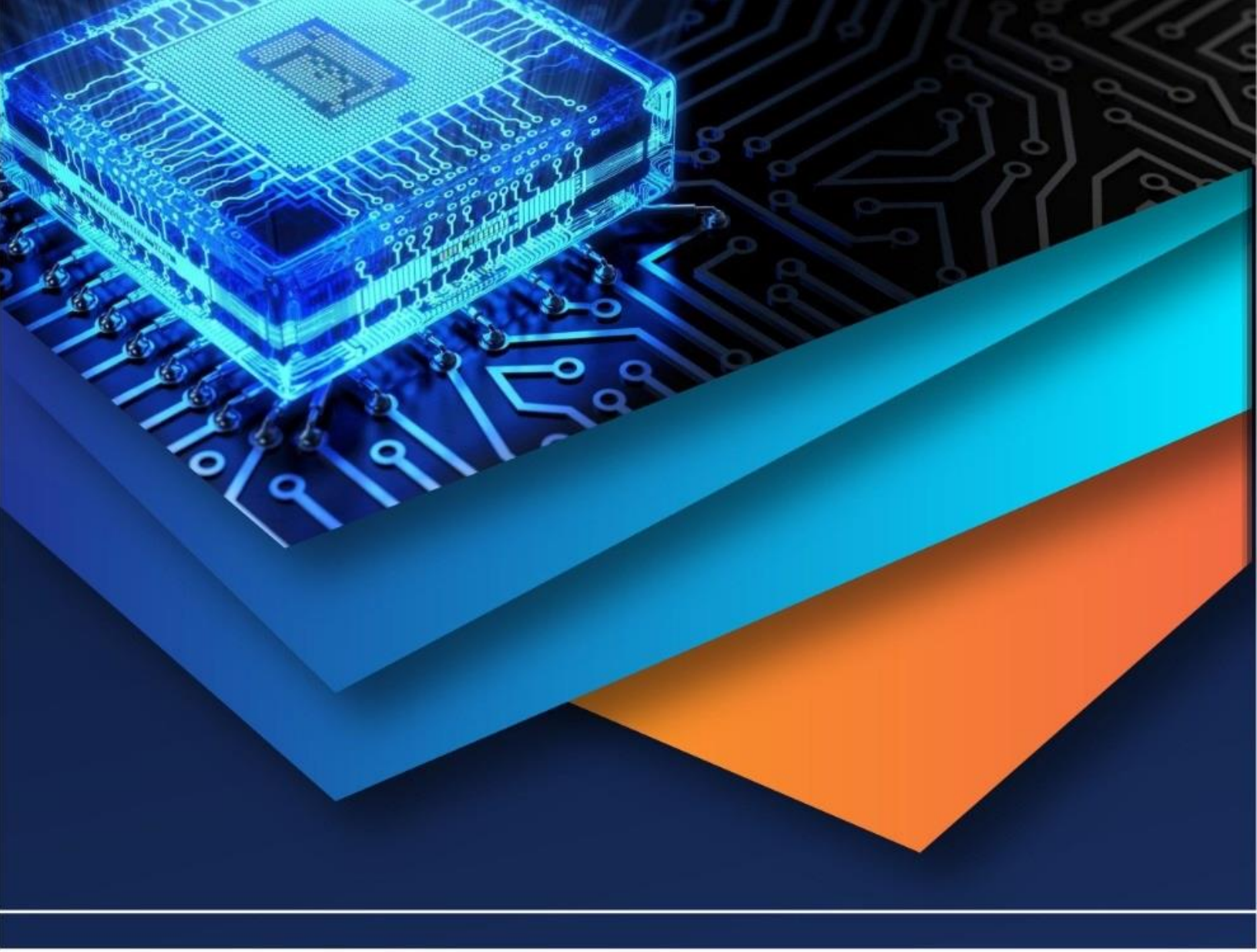

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