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# 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<sup>1</sup>. Therefore, it has a wide scope of utilization in numerous parts of structures to be built up. The addition 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 at 7 days, 14 days, 28 days. 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.

Table 1. 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   |



### 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 of aggregate was 20 mm, specific gravity of coarse aggregate was 2.85. The tests are performed on coarse aggregate according to IS 2386-1963. fineness Modulus of coarse aggregate was 6.91

### C. Fine Aggregate

Locally available sand passing through 4.75mm sieve was utilized 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

Conplast Sp 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 <sup>0</sup> C             |
| 4.    | Air entrainment       | Approx 1 % additional air is entrained |

## II. METHODOLOGY

The plain concrete and jute fiber reinforced concrete samples were prepared by following process for 0.5 %, 0.75% and 1% jute fiber of total mass of concrete. The jute fibers were 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 vibration table and allowed to set for 24 hours. All the specimens were removed from moulds after 24 h. Samples were cured for 7 days, 14 days, 28 days respectively. Concrete cubes were removed from water and tested.

### III. RESULTS

#### A. Compressive Strength Test

This test is performed by the compression testing machine and the compressive quality of concrete cubes were obtained 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 |                                    |

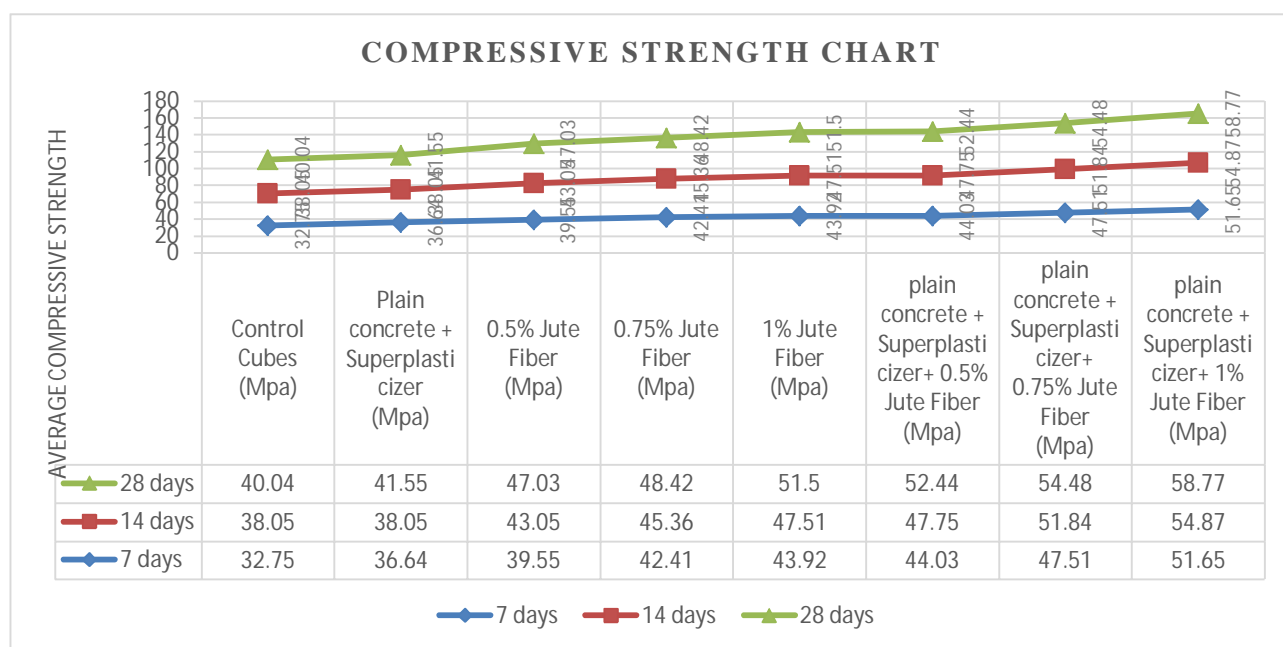


Table7 compressive strength of Concrete with Superplasticizer and different jute fibre percentages

| 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 Superplasticizer 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                              |



#### 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.

#### REFERENCES

- [1] BasuMajumder Absurdum Subhasish Materials Science Centre Indian Institute of Technology 'Development of jute fiber reinforced cement concrete composites', June 2011.
- [2] vajjeSandeepani, Dr.murthyN.R.krishna Study On Addition Of The Natural Fibers Into Concrete by ISSN 2277-8616, Nov 13.
- [3] Kumar Pravin on 'Effect of alkali treatment on jute fibre composite.',2007
- [4] Indian Standard code IS: 383. 1970. "Specification for Coarse and Fine Aggregates from Natural Sources for Concrete"- Code of practice. Bureau of Indian Standards,New Delhi. Indian
- [5] Ramasamy H.S., Ahuja B.M.,Krishnamoorthy S. Behaviour of concrete reinforced with jute fiber by vol.5, feb 1983(ELSEVIER LTD ).
- [6] J. Kim, C. Park, Y. Choi, H. Lee, G An Investigation of Mechanical Properties of Jute Fiber-Reinforced Concrete by Song vol.2 2012.
- [7] Nanayakkaza, N.H., Characterisation ad determination of properties of Sri Lanka coconut, Journal of Natural Fibres, 2, (1), 2005, pp 69-81.
- [8] Ramakrishna, G., and Sundara, T., (2005). Study into the durability of natural Cement and concrete composite fibres and the effect of corroded fibres on the strength of mortar, 27, (5), 2005, pp. 575-582.
- [9] Sreeniwasa,A.,Influence of delignification and alkaline treatment on the fine structure of coir fibres, Journal of Material science, 32, 1999, pp.721-726.
- [10] <https://www.mapsofindia.com/answers/india/state-biggest-jute-producer/>



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