Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 11, November-2019

Performance Properties of Fiber Mix Reinforced Concrete and Conventional Concrete

Rahul
M .Tech C.E
DIT university Dehradun

Aman Saini
Assistant Professor
DIT university Dehradun

***Abstract*: Fiber are generally used as resistance of cracking and improving strength of concrete. In this project jute and polypropylene fibre (pp) were added in various percentages by volume of concrete to know the optimum compressive and tensile strength. The strength are calculated at 0%, 1%, 2%, 3%, & 4%, of jute and polypropylene fibres by volume of concrete.**

A replacement of river sand with query dust has been carried out for increase in strength of the concrete mix. The objective of this work has been finalized, the effect of using polypropylene and jute fibre in concrete as compared to conventional concrete M25 grade by testing in two different test method like compressive strength, and split tensile strength test as per IS 10262:1082 code.

Key words: Polypropylene Fibre, Jute Fibre, Compressive Strength, Split tensile Strength.

1. INTRODUCTION

Concrete is one of the most important materials used in modern civil engineering. It is composite of coarse and fine aggregates which are bound together by means of hydration of cement acting as binding material. Concrete is the most commonly used materials. Generally concrete has high resistant to compression but it has low resistant to against tension.

In the construction sector, the main problem is waste materials during and after constructing each stage of the work of the project. In this project jute fiber and polypropylene fiber were mixed in the various percentage in concrete like 1%, 2%, 3%, 4%, as compare to conventional concrete M25 grade by two different test, compressive strength test, spilt tensile test, as per IS 10262:1082 code.

2. OBJECTIVE OF STUDY

In this experimental study, the mixed design of M25 grade is prepared according to IS 10262:1082 code. The objectives of the study are to check and study the effect of jute and polypropylene were mixed in the various percentage in concrete like 1%, 2%, 3%, 4% using in concrete by testing all the specimens at 7 and 28 days after curing in these two machine test such as compressive strength machine and split tensile strength machine. Also to compare tensile and compressive strength of jute and polypropylene fibre concrete with conventional concrete.

3. EXPERIMENTAL WORKS

3.1Cement: The cement use in this experimental work was 43 grade Ordinary Portland Cement (OPC) manufactured by Ultra – tech cement. The initial and final setting time of cement has to been found respectively 45 minutes and 210 minutes in experiment lad. The specific gravity of cement is 3.13. The physical properties of the cement are listed in table blow.

Table 1. Physical Properties of Cement

S.NO	Test	Results
1	Initial setting time	45 min
2	Final setting time	120 min
3	Standard consistency	30%
4	Specific gravity of cement	3.13

3.2 Fine Aggregate: The locally available river sand used as fine aggregate. Fine aggregates is sieved using 4.75mm sieve to remove the pebbles. The specific gravity of fine aggregate are calculated 2.63. It lies on zone (3) having fineness modules2.3.

Figure1. Fine Aggregate

Table 2. Physical Properties of Fine Aggregate

S.N0	Particular	Results
1	Color	Brown
2	Specific gravity	2.63
3	Fineness modules	2.3

3.3 Quarry Dust: Quarry dust is a waste material obtained from stone quarries while crushing stone, stone crushing dust, which is available abundantly from crusher units at a low cost in many areas, provides a viable alternative for river sand in concrete. In this experiment fully replacement of river sand with quarry dust has been carried out for increase in the strength of the concrete mix.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 11, November-2019

Figure 2. Quarry Dust

Table 3. Physical Properties of Quarry Dust

S.NO	Particular	Results
1	Color	Grey
2	Specific gravity	2.4
3	Fineness modulus	2.46

3.4 Coarse Aggregate: Coarse aggregate used in this experiment are crushed angular aggregate. The specific gravity of coarse aggregate is found 2.62. Different sieve sizes used for sieve analysis of coarse aggregate are 80mm, 40mm, 20mm, 10mm, and 4.75mm.

Figure 3. Coarse Aggregate

Table 4. Physical Properties of Coarse Aggregate

S.NO	Particular	Results
1.	Shape	Angular
2.	Specific gravity	2.62
3.	Fineness modules	7.16

3.5 Polypropylene Fibre: Polypropylene is one of the cheapest and abundantly available polymers. Polypropylene fibres are resistant to most chemical attacks and increase the tensile strength and compressive strength of concrete.

In this project polypropylene fibre with 12mm cut length used. The polypropylene fibre are manufactured by Reliance Company.

Figure 4. Polypropylene Fibre (12mm)

Table 5. Physical Properties of (PP) Fibre

S.NO	Properties	Property Value
1	Polypropylene	100% Synthetic fibre
2	Diameter of Fibre	30-35 micron
3	Melting range	**165° C**
4	Specific gravity	0.91
5	Color	White
6	Resiliency	Good

3.6 Jute Fiber: Jute is a natural fibre with silky shine color and golden, and hence it was called the golden fibre. In this project the locally available jute fibre was used without any treatment. The length of jute fibre is cut into 4cm (40mm) were applied with various percentage of concrete mixture.

Figure 5. Jute fibre (40mm)

Table 6. Physical Properties of jute fibre

S.NO	Parameter	Value
1	Specific gravity	1.5
2	Tenacity	2.7-5.3 gm/tex
3	Color	Golden, yellow, Brown,
4	Moisture region	13.75%
5	Fibre length	50-300mm
6	Resiliency	Bad

4 MIX DESIGN

The design was prepared according to IS: 10262: 2009. The concrete designed was prepared of M25 grade. The conventional concrete was made without use of any admixture.

Table 7: M25 Mix Proportioning

Cement (kg/ m^3)	383.2
Fine aggregate (kg/ m^3)	732.92
Coarse aggregate (kg/ m^3)	1017.82
Water (l/m^3)	191.6
Water cement ratio	0.5

Mix ratio 1: 1.91: 2.72: 0.5

5 EXPERIMENTAL INVESTIGATIONS

In this experiment, the mix design of M25 grade of concrete is prepared according to IS 1062:2009. To find out the mechanical characteristics of jute and polypropylene fibre with replacing of quarry dust. The number of cubes and cylinder is prepared of 30 and 15 respectively. The size of the moulds and cubes, were 150×150×150mm, 150×300mm respectively.

Concrete cube were tested at 7 and 28 days to obtain the compressive strength of concrete and cylindrical specimens were tested at 28 days to obtain the split tensile strength of concrete.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 11, November-2019

6 RESULTS AND DISCUSIONS

6.1: Results of Conventional Concrete to Quarry dust Concrete:

The concept of replacement of fine aggregate by quarry dust may help in many ways like reducing construction cost, increase the strength of concrete mix. The use of quarry dust as fine aggregate give better result in compressive strength.

Table 8: Results of conventional Concrete to Quarry dust Concrete

S.NO	Material	7 days Compressive Strength (N/mm^3)	28 days Compressive Strength (N/mm^3)
1	Fine aggregate	10	25.9
2	Coarse aggregate	14	36.89

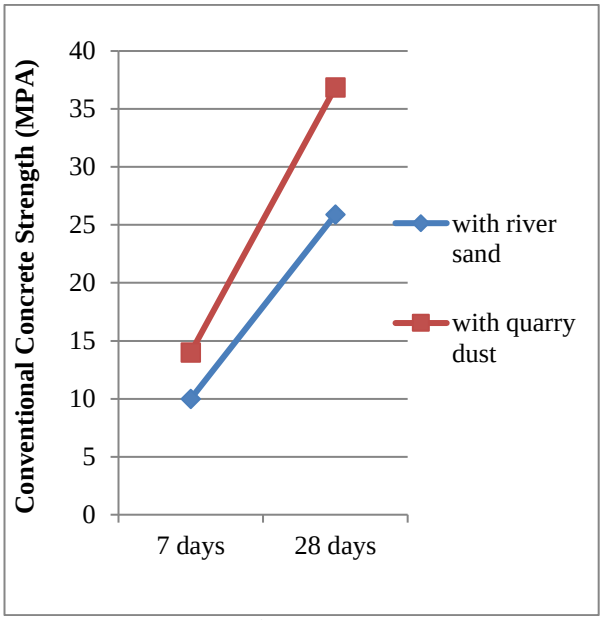

Figure 6: Comparison of Conventional Concrete to Quarry Dust

6.2: Result of Compressive Strength:

It is observed from the figure 7 that the cube compressive strength increased at 3% fibre content there after compressive strength is decreased at 1% and 4% of fibre content. The compressive strength was decreased to 36.7 N/mm^2 for 1% fibre and 38.1$N/mm^2$for 4% fibre content. The compressive strength for conventional mix at 28 days was observed as 36.8 N/mm^2.

Table 9: Result of Compressive Strength

S.NO	% of Fibre	7 days Compressive Strength (N/mm^2)	28 days Compressive Strength (N/mm^2)
1	0	25.3	36.8
2	1	19.6	36.7
3	2	22.23	39.0
4	3	27.96	44.7
5	4	21.29	38.1

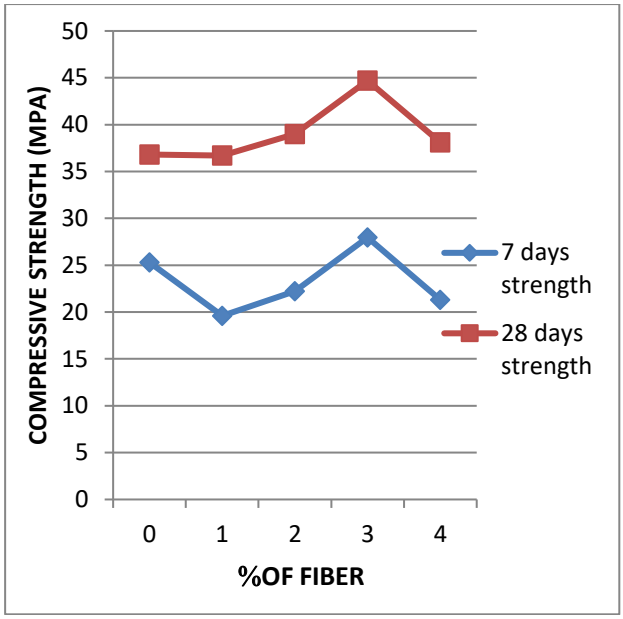

Figure 7: Compressive Strength with Fibre Content

6.3: Result of Split Tensile Strength

The split tensile strength was increased at 3% fibre content there after strength is reduced at 1% and 4% of fibre content. The split tensile strength at 28 days was observed as 3.57 N/mm^2 for 2% of fibre content and 4.17 N/mm^2 for 3% fibre content in the concrete.

However the split tensile strength for conventional mix at 28 days was observed as 3.75 N/mm^2.

Table 10: Result of Split Tensile Strength

S.NO	% of Fibre	28 days Compressive Strength (N/mm^2)
1	0	3.27
2	1	3.22
3	2	3.57
4	3	4.17
5	4	3.42

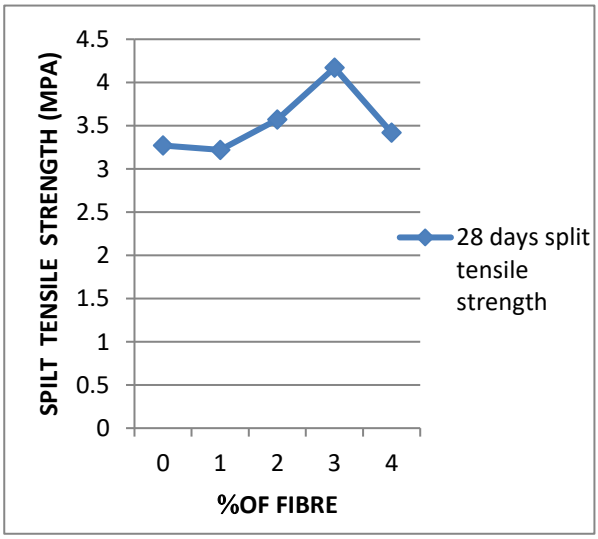

Figure 8: Spilt Tensile Strength with Fibre Content

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 11, November-2019

7: CONCLUSION

1) Compressive strength of 3% of (PP and jute) fibre reinforced concrete has found to be 21% increase in strength at 28 days, when compare to be of conventional concrete.

2) Strength of split tensile strength is increase 27% of 3% fibre content, when compared to the conventional concrete. In this experimental study we concluded that by adding (PP and jute) fibre results maximum strength in 3%fibre content. By observing the experiment study of using Jute and Polypropylene fibre, it is investigations are required in order to find accurate and efficient combination.

REFERENCES

[1] Alhozaimy, A. M. Soroushiad, P. Mirza, F. (1995).Mechanical Properties of Polypropylene
[2] Fibre Reinforced Concrete and the Effects of
[3] Pozzolanic Material. Cement, and Concrete Composites.
[4] Dr.T.Ch.Madhavi, L.Swamy R, Mathur D (2012). Polypropylene Fiber Reinforced Concrete
[5] Patel M. J., Kulkarni S. M.:- "Effect of polypropylene fiber on the high strength concrete" Journal of Information.
[6] Sathe A, and Patil A (013)"Experimental Investigation on Polypropylene Fiber Reinforced Concrete With Artificial" International Journal of Science and Research (IJSR) .
[7] Saeid Kakooei et al., "The effects of polypropylene fibers on the properties of reinforced concrete structures" Construction and Building Materials
[8] Naaman, A.E., (1985) Fiber Reinforcement for Concrete, ACI Concrete International.
[9] Bentur, A. & Mindess, S. Fibre Reinforced Cementitious Composites. London & New York: Taylor & Francis (2007).
[10] B.VijayaRamnatha et.al. Evaluation of mechanical properties of abaca–jute–glass fibre reinforced epoxy Composite',Materials & Design.,Vol. 51,October 013.
[11] S.Prakash chandar, C. Jai balaji, (2015) Experimental study on the mechanical properties of concrete mixed with jute fiber and steel fiber.
[12] Mohammad Zakaria, and abdul Hannan "Effect of jute yarn on the mechanical behavior of concrete composites.