

EXPERIMENTAL INVESTIGATION ON SISAL AND COCONUT FIBRE IN CONCRETE

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Abstract:Concrete is probably the most extensively used construction material in the world. The main ingredient in the conventional concrete is Portland cement. Generally the concrete is good in compression but weak in tension. In order to increase the tensile strength of concrete the natural fibres are added. SISAL FIBRE AND COCONUT FIBRE are the natural fibres whose potential is not fully utilized. Moreover only limited studies have been carried out in India on the use of coconut fibre for the development of high strength concrete with addition of sisal fibres. The study focuses on the compressive strength, split tensile strength, flexural strength performance of the blended concrete containing different percentage of fibres in addition with conventional concrete. The percentage of fibres added with concrete is 0.25% and 0.5% to the total volume of concrete. Different tests were carried out in the specimens like compressive strength, split tensile strength and flexural . Finally, the strength performance of fibre reinforced concrete is compared with the performance of conventional concrete. From the experimental investigations, it has been observed that, the optimum addition of sisal fibre and coconut fibre to concrete is 0.30% for M25 grade.

Keywords: sisal fibre ,concrete testing.

I. INTRODUCTION

Natural fibres are prospective reinforcing materials and their use until now has been more traditional than technical . They have long served many useful purposes but the application of materials technology for the utilization of natural fibres as the reinforcement in concrete has only taken place in comparatively recent years. The distinctive properties of natural fibre reinforced concretes are improved tensile and bending strength, greater ductility, and greater resistance to cracking and hence improved impact strength and toughness. Besides its ability to sustain loads, natural fibre reinforced concrete is also required to be durable. Durability relates to its resistance to deterioration resulting from external causes as well as internal causes. Earlier, mechanical characterization and impact behaviour of concrete reinforced with natural fibres were studied. Here an experimental study was done using sisal fibre and coconut fibre in this investigation.

II. MATERIALS

Sisal fibre is one of the most widely used natural fibres and is very easily cultivated. It has short renewal times and grows wild in the hedges of fields and railway tracks.Nearly 4.5 million tons of sisal fibre is produced every year throughout the world. Tanzania and Brazil are the two main producing countries. Sisal fibre is a hard fibre extracted from the leaves of the sisal plant (*Agave sisalana*). Though native to tropical and sub-tropical North and South America, sisal plant is now widely grown in tropical countries of Africa, the West Indies and the Far East. Sisal fibres are Extracted from the leaves. A sisal plant produces about 200±250 leaves and each leaf contains 1000±1200 fibre bundles which is composed of 4%

fibre, 0.75% cuticle, 8% dry matter and 87.25% water. So normally a leaf weighing about 600 g will yield about 3% by weight of fibre with each leaf containing about 1000 fibres.



Sisal fibre

Coconut fibre is a natural fibre extracted from the husk of coconut found between the hard internal shell and the outer coat of a coconut. Coconut fibre is also known as coir, when dried contains cellulose, lignin, pentosans and ash in varying percentage. coconut fibre is a fibre which has the better physical and chemical property also it is renewable, cheap, resistant to thermal conductivity, more durable, highest toughness, most ductile than the other natural fibre. It is capable of taking strain four times more than other fibre. The advantage of coconut fibre are low density, resistance to fungi, moth and rot, excellent insulation to sound, flame, moisture and dampness.



Coconut Fibre

III. EXPERIMENTAL PROGRAM

Total number 36 cubes, 24 cylinder and 12 prisms were casted. Coconut fibre were added in concrete in different percentage of 0.25% & 0.5% And also sisal fibre was added in the concrete at same amount of 0.25% & 0.5% , 3 cubes, 3 cylinders and 3 prisms were casted. Final strength of cube, cylinder and prism were tested after 28 days curing. Compression testing machine is used for testing the compressive strength of cube and split tensile strength of cylinder. The crushing loads were noted and average compressive strength and tensile strength for three specimens is determined respectively. The flexural strength test has been

done on prism of size 100x100x500mm by Universal Testing Machine. This was done by single point load test having an end bearing of 50mm from each support.



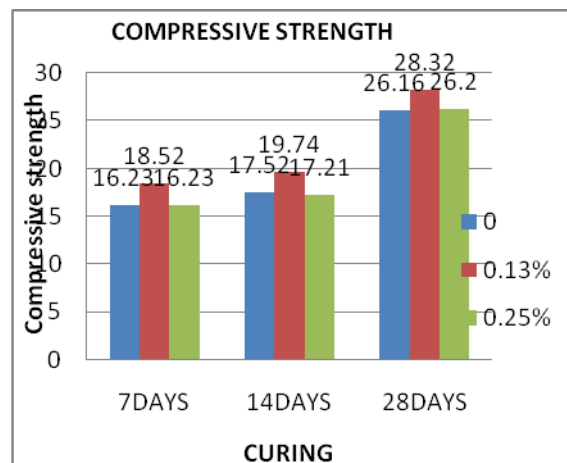
Mixing of concrete

Casted specimen

IV. RESULTS AND FINDINGS

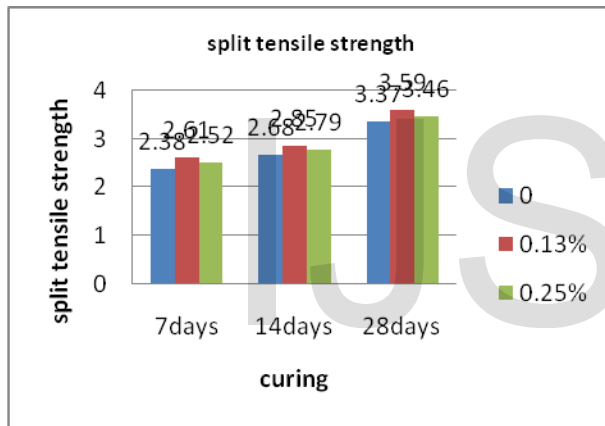
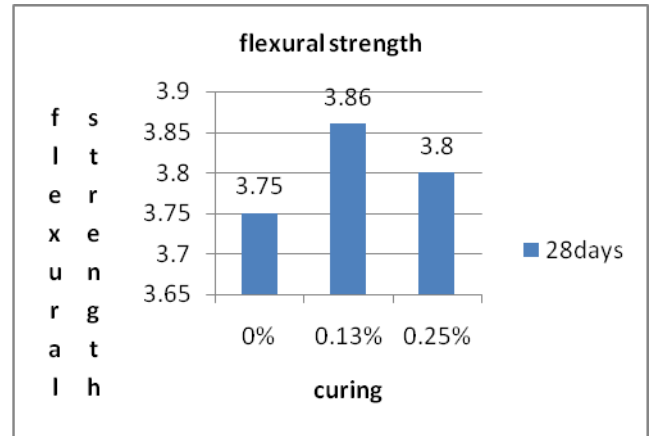
Compressive Strength of Normal Concrete and sisal & Coconut fibre Added Concrete – 7, 14, 28 day

S N O	NAME OF THE SPECIM EN	PERCENTAGE OF ADDED (sisal +coconut fibre)	COMPRESSIVE STRENGTH(N/mm ²)		
			7days	14days	28days
1	M1	0%+0%	16.23	17.52	26.16
2	M2	0.125%+0.125%	18.52	19.74	28.32
3	M3	0.25%+0.25%	16.23	17.21	26.2



Split tensile strength of normal concrete and sisal and coconut fibre added concrete 7,14&28 days

S. NO	NAME OF THE SPECIMEN	PERCENTAGE OF ADDED (sisal+coconut fibre)	SPLIT TENSILE STRENGTH(N/mm ²)		
			7days	14days	28days
1	M1	0%+0%	2.38	2.68	3.37
2	M2	0.125%+0.125%	2.61	2.85	3.59
3	M3	0.25%+0.25%	2.52	2.79	3.46



Flexural strength of normal concrete and sisal and coconut added concrete 7,14&28days

S.NO	NAME OF THE SPECIMEN	PERCENTAGE OF ADDED (sisal +coconut fibre)	FLEXURAL STRENGTH(N/mm ²)
			28 days
1	M1	0%+0%	3.75
2	M2	0.125%+0.125%	3.86
3	M3	0.25%+0.25%	3.8

V. CONCLUSION

- The result obtained from the compressive test shows that the increase in the compressive strength of the concrete with reinforced of sisal and coconut fibre
- There is a gradual increase in the mechanical property of concrete by increasing the sisal and coconut fibre upto 0.25% and on further addition of fibre decreases the strength parameters
- Tensile strength of concrete is increased for 0.25% of sisal and coconut fibre.
- Durability of the concrete decrease due to the addition of coconut fibre.

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