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A PROJECT REPORT ON COCONUT FIBRE REINFORCED CONCRETE

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ABSTRACT

Concrete needs to be reinforced in order to improve its engineering qualities. Coconut fibers were employed for this study since they are widely accessible and come in big numbers. The study includes a comparison of the qualities of regular concrete and concrete reinforced with coconut fibre based on laboratory experimentation. Better management of these waste fibres will result from the usage of coconut fibres. The study discovered that 1%, 2% and 3% of ideal fibre content (by weight of cement). To identify the ideal range of fibre content so that fibre reinforced concrete can be made, additional effort is needed by adjusting the fibre content and aspect ratio.

Keywords: Economic Value, Coconut Fiber, Saving of Concrete, Flexural Strength of Concrete.

INTRODUCTION

One of the undesirable characteristics of the concrete as a brittle material is its low lastingness, and strain capability. Therefore, it needs reinforcement so as to be used because the most generally construction material. Conventionally, this reinforcement is within the kind of continuous steel bars placed within the concrete structure within the acceptable positions to face up to the obligatory tensile and shear stresses. Fibers, on the opposite hand, ar usually short, discontinuous, and every which way distributed throughout the concrete member to provide a composite construction material called fiber ferroconcrete (FRC). Fibers utilized in cement-based composites ar primarily made from steel, glass, and chemical compound or derived from natural materials. Fibers can control cracking more effectively due to their tendency to be more closely spaced than conventional reinforcing steel bars. It ought to be highlighted that fiber used because the concrete reinforcement isn't a substitute for standard steel bars. Fibers and steel bars have totally different roles to play in advanced concrete technology, and there ar several applications during which each fibers and continuous reinforcing steel bars ought to be used. Coconut fibers (Coir fibers) are one of the most popular type of fibers used as concrete reinforcement. Coconut fiber being the most ductile among all natural fibers has the potential to be used as a reinforcement material in concrete. It is biodegradable so the impact on environment will be minimal. This is also a way to dispose of the fibers which are derived as waste materials from coir based manufacturing units to produce high strength materials .They are also nonabrasive in nature ,cheap and easily available. Initially, CFs are used to prevent/control plastic and drying shrinkage in concrete. Further research and development revealed that addition of CFs in concrete significantly increases its compressive strength, the energy absorption capacity, ductile behavior prior to the ultimate failure, reduced cracking, and improved durability. This study reviews the effects of addition of CFs in concrete, and investigates themechanical properties, and applications of coconut fiber reinforced concrete (CFRC).

MATERIALS USED

Cement:

Cement is a first-rate gray powder used as a binding fabric withinside the concrete mix. The cement is blended with satisfactory aggregates, coarse aggregates, without or with admixtures and water. The regular cement includes simple components particularly argillaceous and calcareous. In argillaceous, clay is the main fabric while calcareous carries excessive percentage of calcium carbonate withinside the shape of calcite or aragonite. In this undertaking we're the usage of OPC fifty three grade that is commercially to be had and maximum typically utilized in concrete structures. The bodily and lab checks are carried out for the cement. The cement is in uniform colour and loose from lumps.

Fine aggregate:

Aggregate between 4.75mm to 0.075mm are considered as fine aggregates. Locally and nearly available river sand is used as fine aggregate. The sand particles should also pack to minimum void ratio. Higher void content leads to requirement of more mixing of water. Locally available river sand passed through 4.75mm IS sieve is used as fine aggregate. River sand conforming to zone II as per IS-383-1970 and with a fineness modulus of 2.46 is used this project

Coarse aggregate:

Coarse aggregates refer to irregular and granular materials such as sand, gravel, or crushed stone, and are used for making concrete. In most cases, Coarse is naturally occurring and can be obtained by blasting quarries or crushing them by hand or crushers. It is imperative to wash them before using them for producing concrete. Their angularity and strength affect the concrete in numerous ways. Needless to say, the selection of these aggregates is a very important process. Materials that are large enough to be retained on the 4.7mm sieve size usually constitute coarse aggregates and can reach a maximum size of 63mm. Coarse aggregate above 20mm upto 30mm used in project.

Coconut Fibre:

There are two types of coconut fibres, brown fibre extracted from matured coconuts and white fibres extracted from immature coconuts. Coconut fibres are stiff and tough and have low thermal conductivity. Coconut fibres are commercial available in three forms, namely bristle (long fibres), mattress (relatively short) and decorticated (mixed fibres).

Coconut coir has a tensile strength of 15 to 327 MPa, an elongation of 10 to 75%, and has various sizes. Their diameter is from 0.1 to 0.6 mm, and its length is from 50 to 350 mm. It consists of 40% lignin, 54% cellulose, and 6% other water-soluble substances. Due to the high lignin content, coconut coir degradation can occur up to 10 years, taking longer than other natural fibers . Celluloseprovides higher mechanical strength (tensile and flexural) and rigidity than other fibers. Coir fibers maintain their tensile strength in wet conditions, have a higher coefficient of friction and are more elastic than synthetic fibers.

Water:

Water is an critical factor of concrete that chemically reacts with cement and enables in binding of material. Since it allows in binding, the great and amount of water must be measured very carefully. So PH price of water ought to be maintained among 6 -8. Quantity of water is likewise maintained flawlessly because, if amount of water is excessive it can will increase workability however it damages the slump. If it's miles low it damages the layout of mix. So highest quality content material of water have to be maintained.

EXPERIMENTAL STUDY

Table: 4.1 Physical properties of cement

S.NO	Physical properties	Test results	Requirements as per IS code books
1.	Specific gravity	3.15	3.10-3.15
2.	Fineness	7%	<10%
3.	Initial setting time	25min	30min
4.	Final setting time	176min	600min

Table: 4.2 Physical properties of fine aggregate

Physical Properties	Result	Requirements As Per I.S Code Book
Specific gravity	2.525	2.5 to 3.0
Fineness modulus	3.05	2.2 to 3.2
Bulking of sand	8%	Good
Water absorption	2%	<3%
Silt content in sand	3%	<8%

Table: 4.3 Physical properties of coarse aggregate

PHYSICAL PROPERTIES	RESULTS	REQUIREMENTS AS PER I.S CODE BOOK
Specific gravity	2.86	2.5 to 3.0
Fineness modulus	3.304	2 to 4
Water absorption	2.27	0.1 to 2%
Impact load	22.38%	20 to 30% (satisfactory for roadsurface)

TESTS AND RESULTS

Table:6.1 Slump obtained for M_{20} concrete with addition of CF percentage

Grade	Water Cement Ratio	Slump
M20 - 0%	0.42	0-40
1%	0.52	10-50
2%	0.55	10-60
3%	0.6	10-60

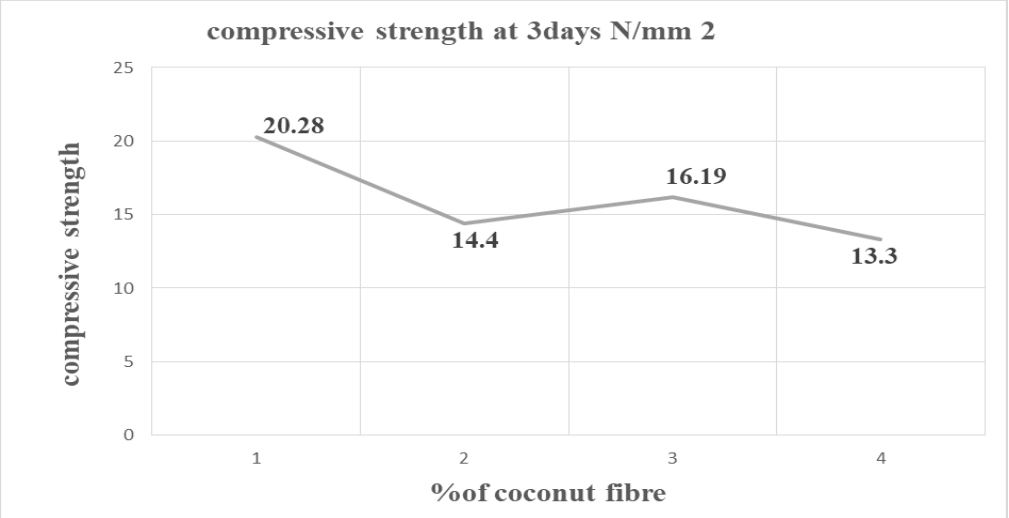
Table: 6.2 Compressive load (kn)

CURING DAYS	0%	1%	2%	3%
3 DAYS	456.5	323.4	364.3	299.3
7 DAYS	493.2	349.8	400.5	359.5
14 DAYS	509.8	493.5	454.3	439.5
28 DAYS	716	688.5	663.5	698

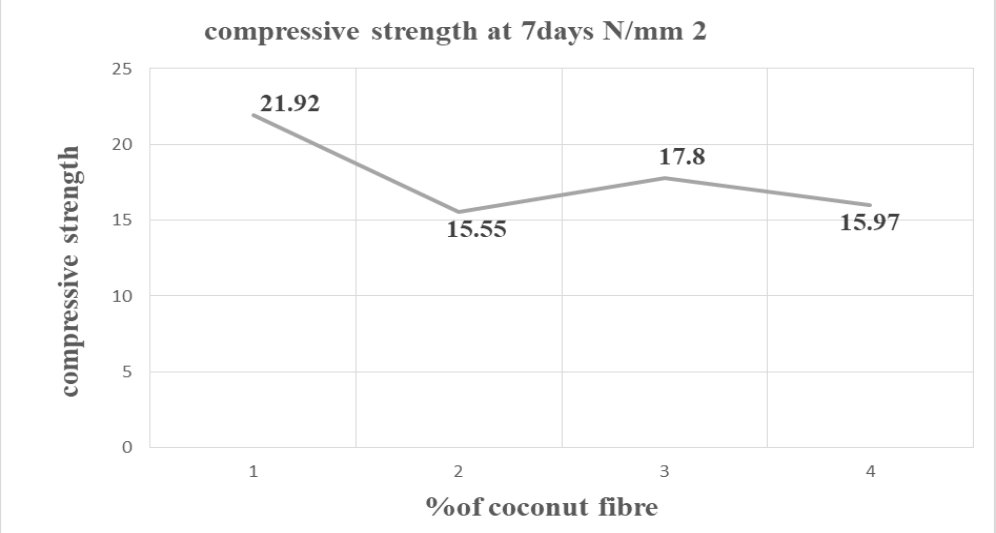
Table: 6.3 Compressive Strength (N/sq.mm)

CURING DAYS	0%	1%	2%	3%
3 DAYS	20.28	14.4	16.19	13.30
7 DAYS	21.92	15.55	17.8	15.97
14 DAYS	22.66	21.93	20.19	19.53
28 DAYS	31.82	30.6	29.48	31.02

Graph:6.1 Compressive strength of concrete (3 Days)



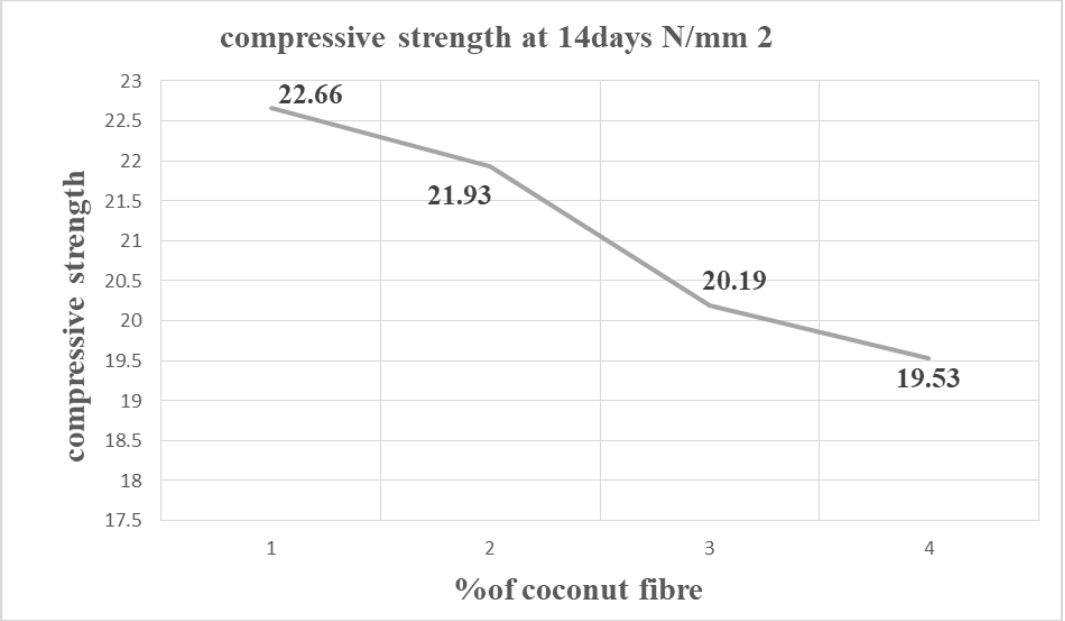
It is observed that the maximum compressive strength is 20.28 Mpa of normal concrete (M_{20})for 3 days



Graph:6.2 Compressive strength of concrete (7 Days)

It is observed that the maximum compressive strength is 21.92 Mpa of normal concrete (M_{20})for 7 days

Graph:6.3 Compressive strength of concrete (14 Days)



It is observed that the maximum compressive strength is 22.66 Mpa of normal concrete (M_{20})for 14 days

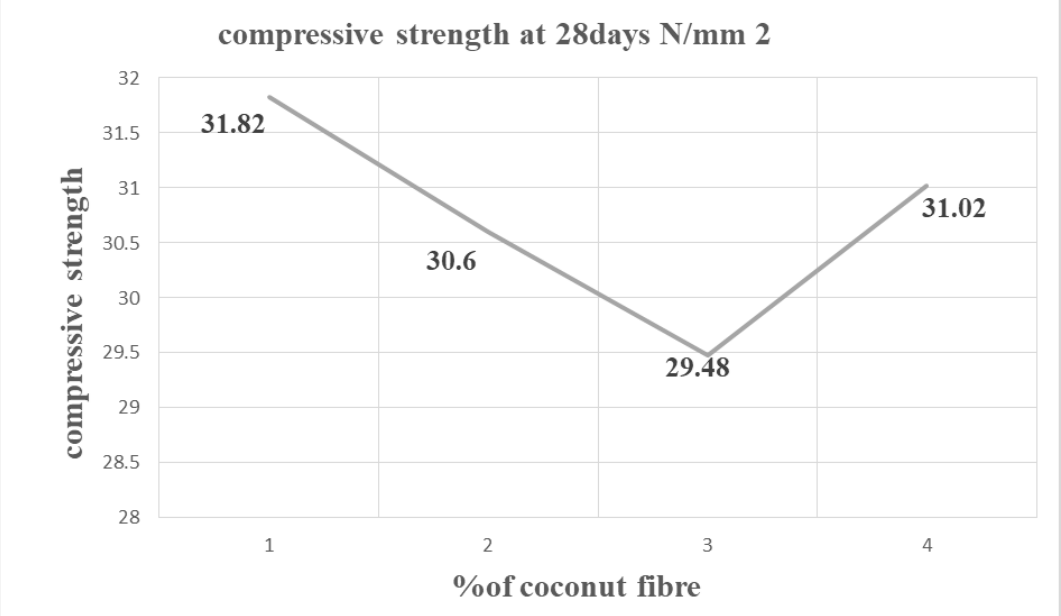


Table:6.4 Compressive strength of concrete (28 Days)

It is observed that the maximum compressive strength is 31.82 Mpa of normal concrete (M_{20})for 28 days

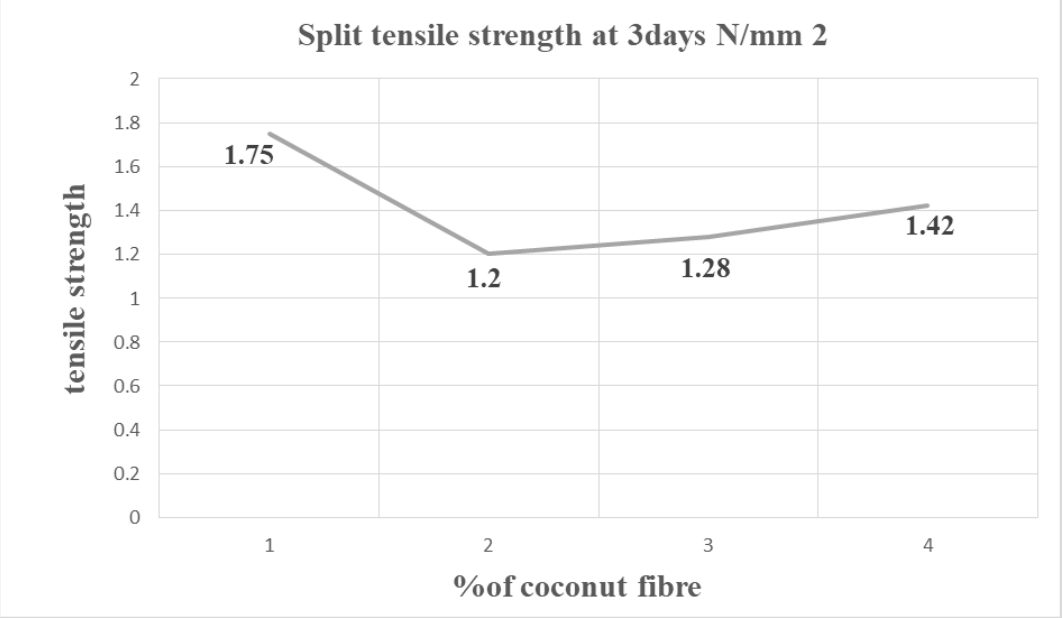
Table: 6.4.1 Split tensile strength load (KN)

CURING DAYS	0% (KN)	1% (KN)	2% (KN)	3% (KN)
3 DAYS	124	85.5	90.5	100.5
7 DAYS	130	98	120	96.75
14 DAYS	149	134.3	123.3	101
28 DAYS	173.18	154	102	113.1

Table: 6.4.2 Tensile strength (N/mm²)

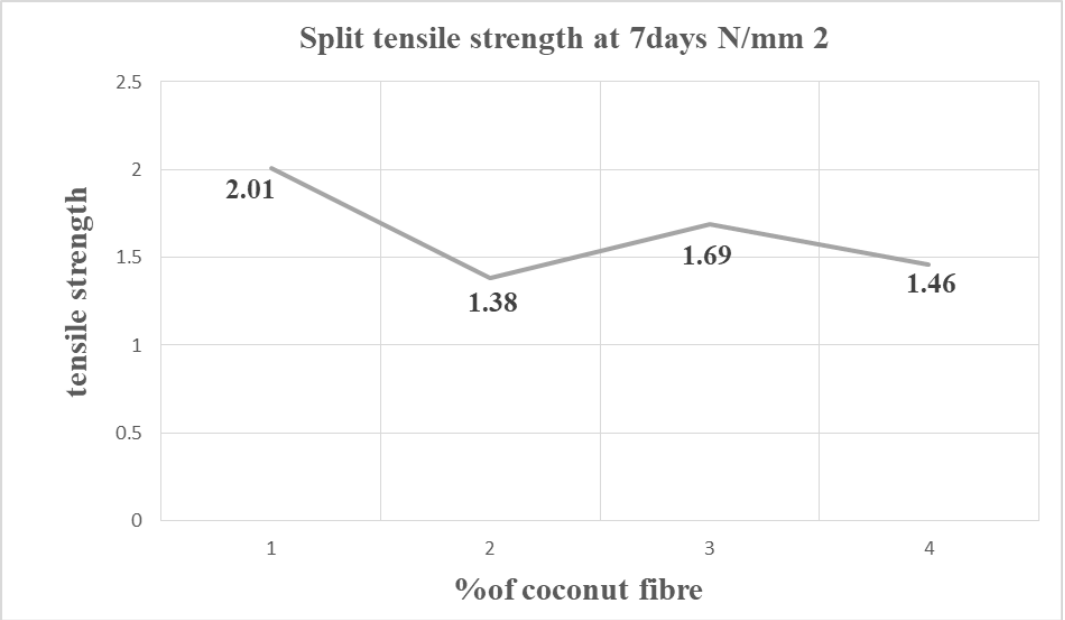
CURING DAYS	0% (N/mm²)	1% (N/mm²)	2% (N/mm²)	3% (N/mm²)
3 DAYS	1.754	1.20	1.28	1.42
7 DAYS	2.03	1.38	1.69	1.46
14 DAYS	2.108	1.89	1.74	1.42
28 DAYS	2.45	2.17	1.44	1.6

Graph:6.4.1 Split tensile strength of concrete (3 Days)



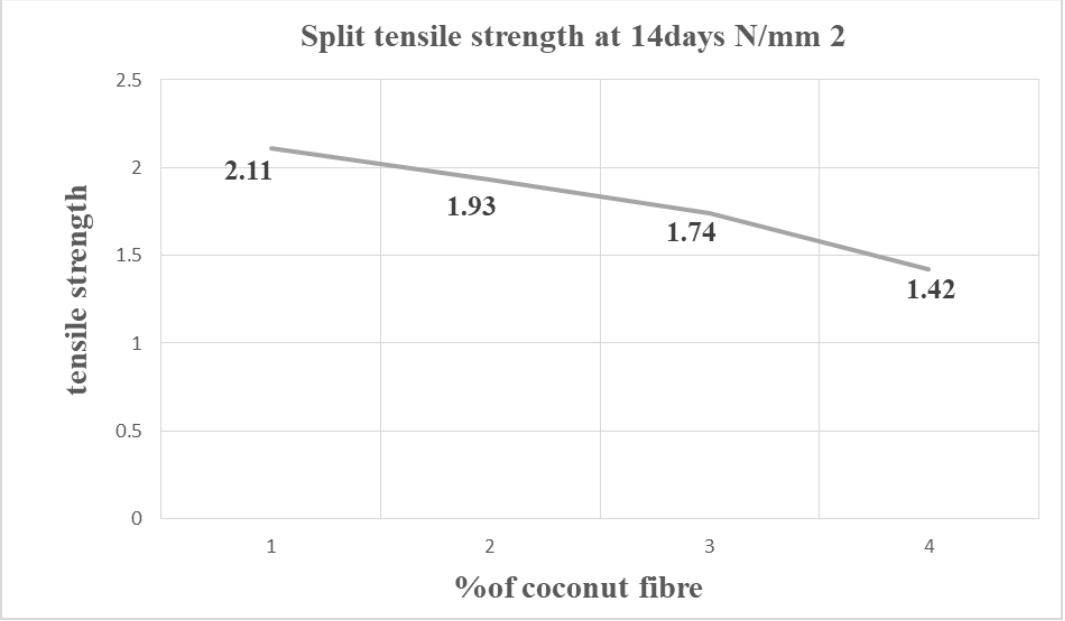
It is observed that the maximum split tensile strength is 1.75 Mpa of normal concrete (M_{20}) for3 days

Graph:6.4.2 Split tensile strength of concrete (7 Days)



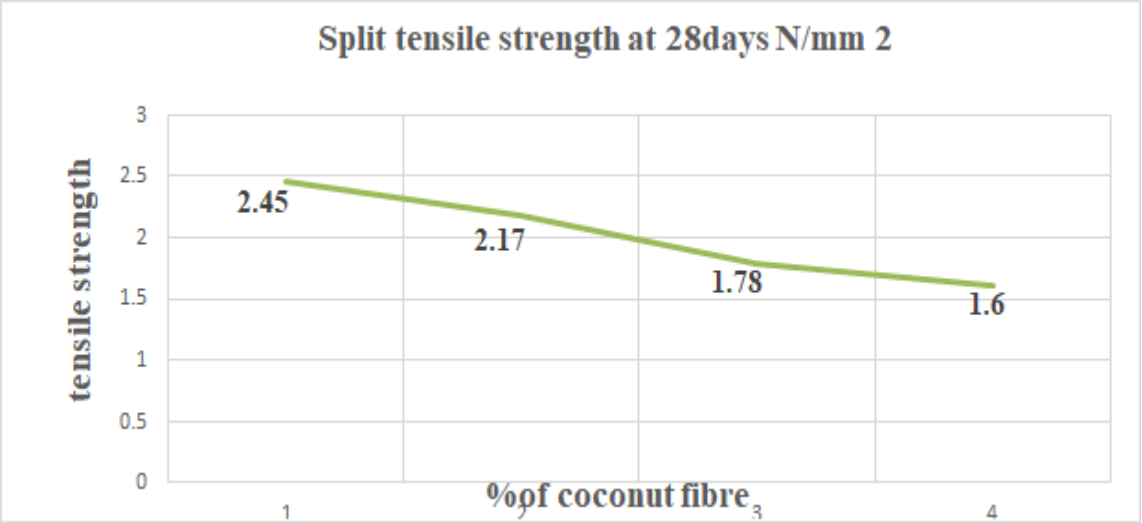
It is observed that the maximum split tensile strength is 2.01 Mpa of normal concrete (M_{20}) for7 days

Graph: 6.4.3 Split tensile strength of concrete (14 Days)



It is observed that the maximum split tensile strength is 2.11 Mpa of normal concrete (M_{20}) for14 days

Graph: 6.4.4 Split tensile strength of concrete (28 Days)



It is observed that the maximum split tensile strength is 2.45 Mpa of normal concrete (M_{20}) for28 days

CONCLUSION

This chapter summarizes the overall conclusion obtained by the experiment:

- ✓ The properties of coconut Fiber reinforced concrete, compressive strength and tensile strength ofconcrete is investigated experimentally using the standard procedures.
- ✓ With respect to compressive strength, incorporating a small amount of CF 2% enhances theperformance of concrete, as expected and counters harmful shrinkage effects in concrete.
- ✓ The results suggests that short coconut fibers are more effective in enhancing the performance ofconcrete
- ✓ The recommended threshold value of the fiber content that will benefit the long term durabilityof the concrete in all environments is 2.0%
- ✓ The properties can increase or decrease depending upon fiber length and its content. As a resultof this CFRC strengths can be less than that of plain concrete.
- ✓ By replacing cement content with CF, decrement in the weight thus INERTIA OF STRUCTUREmay result in to low density, slender and economical as well as green structures
- ✓ It is a versatile material reported as most ductile and energy absorbent have wide scope inearthquake prone areas as well as in marine structures.

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LIST OF I.S CODE RECOMMENDATIONS:

- I.S: 12269:1987, Indian Standard Ordinary Portland cement, 53 Grade Specification.
- I.S: 383-1970. Indian Standard Specification For Course And Fine Aggregates From NaturalSources For Concrete.
- IS: 2386:1963, Methods for test for aggregates of concrete.
- I.S: 516:1959, Methods of test for strength of concrete.