

An Experimental Study on Fiber Concrete by Using Coconut Coir

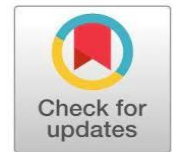
D.Nithick Vaas, V.Pachiyappan, S.Reboies

UG Students, Department of Civil Engineering,
Sengunthar Engineering College (Autonomous), Tiruchengode, India
sabarivaas8@gmail.com, krmathan377@gmail.com, rifu56789@gmail.com

M.Chitra 

Assistant Professor & Supervisor, Department of Civil Engineering
Sengunthar Engineering College (Autonomous), Tiruchengode, India
mchitra.civil@scteng.co.in

<https://orcid.org/0009-0001-2768-3580>



Publication History

Manuscript Reference No: IJIRAE/RS/Vol.13/Issue03/AEMR26.MRAE10098

Research Article | Open Access | Double-Blind Peer-Reviewed | Article ID:IJIRAE/RS/Vol.13/Issue03/AEMR26.MRAE10098

Received:22,February 2026, Revised: 01, March 2026, Accepted: 16,March 2026,Published Online: 25, March 2026.

<https://www.ijirae.com/volumes/Vol13/iss-03/19.AEMR26.MRAE10098.pdf>

Article Citation:Nithick,Pachiyappan,Reboies,Chitra(2026),An Experimental Study on Fiber Concrete by Using Coconut Coir, IJIRAE: International Journal of Innovative Research in Advanced Engineering, Volume 13, Issue 03 of 2026 pages 191-194 **Doi:->** <https://doi.org/10.26562/ijirae.2026.v1303.19>

BibTeX Key: Nithick@2026Experimental

IJIRAE papers should be cited as IJIRAE (International Journal of Innovative Research in Advanced Engineering, AM Publications, India 2025, ISSN 2349-2163, <https://doi.org/10.26562/ijirae.2026.v1303.19> The journal's official abbreviation is IJIRAE. **Orcid:** <https://orcid.org/0009-0004-9398-7488>

About the License: Copyright©2026 copyright by the authors. This article is an open access and license under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Abstract: Concrete is widely used in construction, but it has low tensile strength and is prone to cracking. Fibre reinforced concrete is one method used to improve the mechanical properties of concrete. This study investigates the use of natural coconut coir fibre as reinforcement in concrete. Coconut coir fibre is an eco- friendly and low-cost material obtained from coconut husk. In this experimental study, different percentages of coir fibre are added to concrete to evaluate their effect on strength properties. Test specimens such as cubes, cylinders, and prisms are cast and cured. Tests including compressive strength, split tensile strength, and flexural strength are conducted. The results show that the addition of coconut coir fibre improves tensile strength, crack resistance, and ductilityof concrete. Therefore, coconut coir fibre can be used as a sustainable material in fibre reinforced concrete for improving performance and reducing environmental impact.

Keywords: Coconut coir fibre, fibre reinforced concrete, compressive strength, tensile strength, sustainable material.

I. INTRODUCTION

Concrete is one of the most widely used construction materials due to its high compressive strength and durability. However, concrete is weak in tension and easily develops cracks under tensile stresses. These cracks may reduce the strength and durability of structures. To overcome this problem, fibres are added to concrete to improve its tensile strength, ductility, and crack resistance. Fibre reinforced concrete (FRC) is a type of concrete in which fibres are added to the mix to improve its mechanical properties. Various types of fibres such as steel, glass, synthetic, and natural fibres are used. In recent years, natural fibres have gained attention because they are eco-friendly, economical, and easily available. Coconut coir fibre is a natural fibre obtained from the husk of coconut. It has good toughness, high durability, and resistance to moisture. In countries like India, coconut coir is widely available as an agricultural waste material. Using coconut coir fibre in concrete can improve the strength properties while also promoting sustainable construction practices. This study focuses on the experimental investigation of concrete by adding coconut coir fibres in different percentages. The mechanical properties such as compressive strength, tensile strength, and flexural strength are evaluated to determine the effectiveness of coir fibre in concrete.

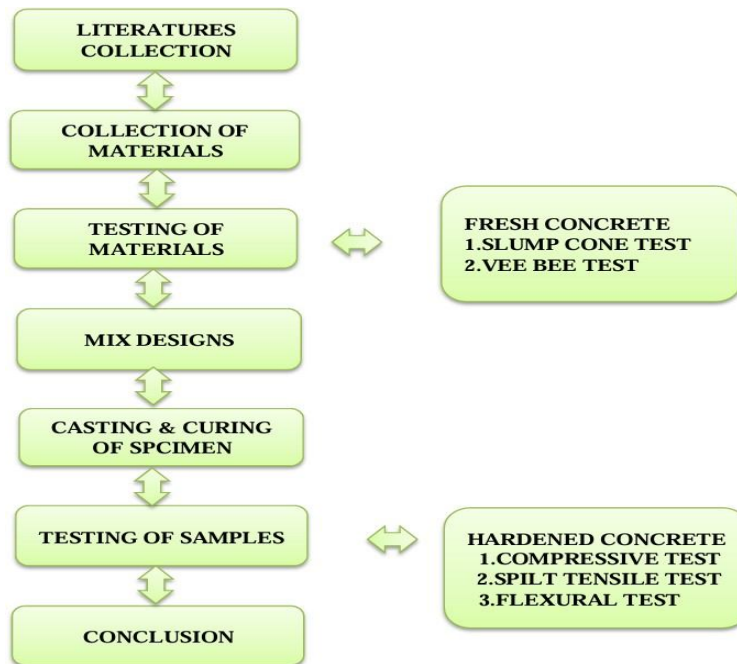
II. OBJECTIVES OF THE STUDY

The main objective of this study is to investigate the performance of fibre reinforced concrete using coconut coir fibre as a natural reinforcing material. This study aims to evaluate the effect of coir fibre on the mechanical properties of concrete such as compressive strength, split tensile strength, and flexural strength. It also focuses on determining the optimum percentage of coconut coir fibre that improves the strength and durability of concrete. In addition, the study encourages the use of eco-friendly and sustainable materials in construction.

III. SCOPE OF STUDY

This study focuses on the use of coconut coir fibre in fibre reinforced concrete. Concrete mixes are prepared by adding different percentages of coir fibre. Test specimens such as cubes, cylinders, and prisms are cast and cured. Laboratory tests like compressive strength, split tensile strength, flexural strength, slump conetest, and Vee-Beetest are conducted to study the strength and workability of the concrete. The study is limited to laboratory experiments

IV. METHODOLOGY



A. MATERIALS USED

- a) Cement
- b) Coarse Aggregate
- c) Fine Aggregate
- d) Water
- e) Coconut Coir

B. TESTING OF MATERIALS

The materials used in this study such as cement, fine aggregate (sand), coarse aggregate, and coconut coir fibre are tested to determine their properties before preparing the concrete mix. Tests on cement include specific gravity and standard consistency. Fine aggregate and coarse aggregate are tested for specific gravity and sieve analysis. Coconut coir fibre is cleaned and cut into required lengths before mixing with concrete. These tests help to ensure the quality of materials and suitability for preparing fibre reinforced concrete.

C. FRESH CONCRETE TEST

- a) Slump Cone Test
- b) Vee-Bee Consistency Test

D. HARDENED CONCRETE TEST

- a) Compressive Strength Test
- b) Split Tensile Strength Test
- c) Flexural Strength Test

V. MIX DESIGN

DESIGN STIPULATIONS

Characteristic compressive strength required in field at 28 days – 25N/mm²

Maximum size of aggregate – 20mm Degree of quality control– Good Type of exposure – Mild

TEST DATA FOR MATERIALS

Cement Used - OPC Specific Gravity of Cement -3.15 Coarse Aggregate -2.92

Fine Aggregate- 2.80

MIX DESIGN

Water cement ratio = 0.5 Cement content.=32kg Fine aggregate =52kg Coarse aggregate =90kg

1. WATER REQUIRED

Water=0.5*32=16L

2. LAB MIX

Cement =32kg Fine aggregate=52kg Coarse aggregate=90kg Water =16L

3. Mix ratio

Mix Ratio = Material Weight/Cement Weight Cement: Sand: Aggregate=32/32:52/32:90/32 =1:1.63:2.81

1% COCONUT COIR MIX

Coir=1/100*Cement =0.01*32 =0.32kg

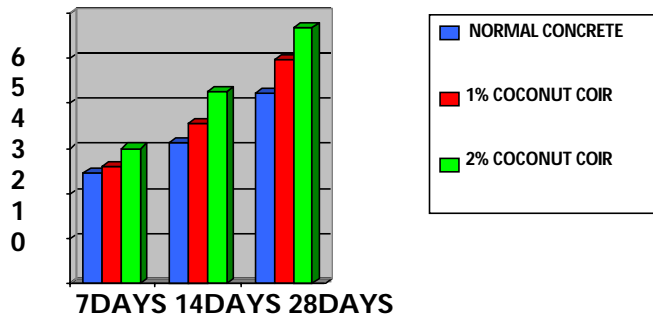
2% COCONUT COIR MIX

Coir=2/100*Cement =0.02*32 =0.64kg

MIX PROPORTION TABLE

Mix type	Cement	Sand	Coarse Aggregate	Water(L)	Coconut coir
Normal Mix	32	52	90	16	0
1% Coir Mix	32	52	90	16	0.32
2% Coir Mix	32	52	90	16	0.64

SLUMP CONE TEST



FLEXURAL STRENGTH TEST

Mix Type`	Slump Value (MM)	Work Ability
NORMAL CONCRETE	75MM	MEDIUM
1% COIR CONCRETE	65MM	MEDIUM
2% COIR CONCRETE	55MM	MEDIUM

VEE-BEE TEST

Mix Type %	7days	14days	28days
NORMAL CONCRETE	2.45	3.12	4.22
1% COIR FIBRE MIX	2.60	3.54	4.98
2% COIR FIBRE MIX	3.00	4.25	5.67

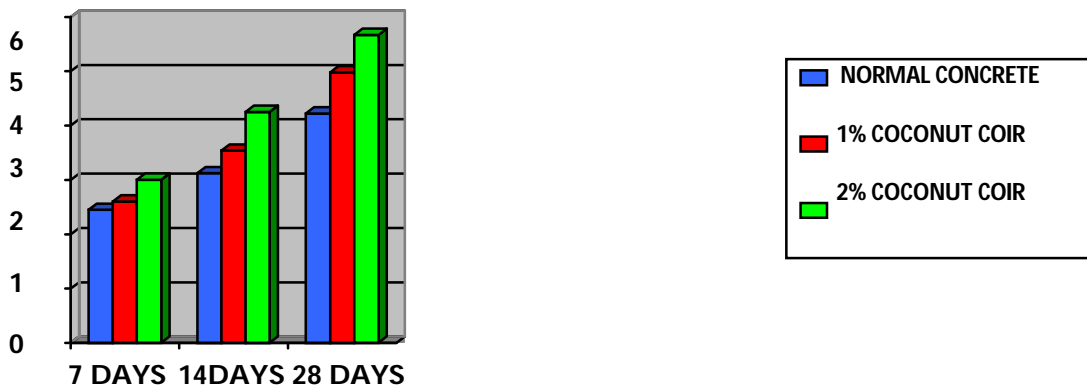
FLEXURAL STRENGTH RESULT

Mix Type	VeeBee Test	Work Ability
NORMAL CONCRETE	08sec	MEDIUM
1% COIR CONCRETE	10sec	MEDIUM
2% COIR CONCRETE	14sec	LOW

RESULT

COMPRESSIVE STRENGTH TEST

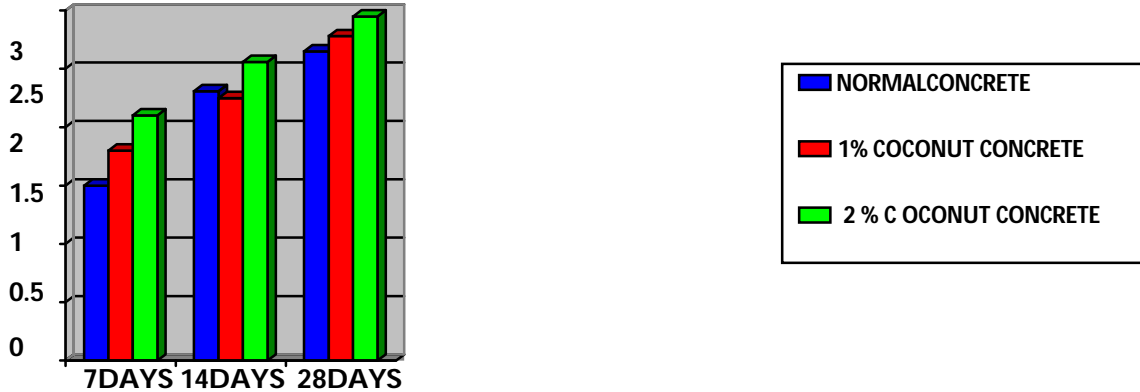
Mix Type	Compressive Strength (MPa)		
%	7days	14days	28days
Normal Concrete	26.59	31.13	37.36
1% COIR FIBRE MIX	27.39	33.11	33.71
2% COIR FIBRE MIX	32.08	33.71	38.95



COMPRESSIVE STRENGTH RESULT SPLITTEN SILE TEST

Mix Type	Splitensiles Strength (MPa)		
	7days	14days	28days
NORMAL CONCRETE	1.50	2.31	2.65
1% COIR FIBRE MIX	1.80	2.25	2.78
2% COIR FIBRE MIX	2.10	2.56	2.95

SPLITTENSILE RESULT



CONCLUSION

The experimental study on fibre concrete using coconut coir has demonstrated that incorporating this natural fibre significantly enhances the mechanical and durability properties of concrete. The findings indicate that the addition of coconut coir not only improves tensile and flexural strength, but also contributes to better crack resistance and overall, on gravity of the concrete mix. Furthermore, utilizing coconut coir, an abundant and renewable resource, aligns with sustainable construction practices by reducing reliance on traditional materials and lowering the carbon footprint. The cost-effectiveness of using agricultural by products like coconut coir presents an economic advantage, making this composite material an appealing option for various construction applications. Overall, the positive outcomes of this study suggest that coconut coir fibre concrete is a promising innovation that warrants further exploration to optimize its formulation and assess its long-term performance in real- world conditions.

REFERENCES

1. A.R.Santhakumar (2007), "Concrete Technology", Oxford University Press.
2. Aziz MA, Paramasivam P, and Lee SL. Concrete reinforced with Natural Fibers. New Reinforced Concretes Ed: Swamy RN, Surrey University Press, pp. 106-140.
3. Sivaraja M, Kandasamy S. Characterization of natural fibres as concrete composites for energy absorption., International Journal of Materials and Product Technology, Nos. 1-4, 36(2009) 385-95.
4. IS 10262-2009 Indian Standard Recommended Guidelines for concrete Mix Design, 5th Print March 2009 Bureau of Indian Standards, New Delhi - 110 002.
5. IS 456:2000. Indian standard plain and reinforced concrete-code of practice.
6. IS:8122-1989. Specification for 43 grade Portland cement, Bureau of Indian standards, New Delhi, India.
7. IS:383-1970. Specification for coarse and fine aggregate from natural source for concrete, Bureau of Indian standard, New Delhi, India
8. IS:1199-1959. Indian Standards Methods of sampling and analysis of concrete, Bureau of Indian Standards, New Delhi, India.
9. IS:516-1959. Indian Standard Code of practice methods of test for strength of concrete, Bureau of Indian Standards, New Delhi, India.
10. M.S.Shetty(2016), " Concrete Technology ", Chand & Company Ltd., New Delhi