

# A Review on Coconut Fiber Strength and Its Properties

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## ABSTRACT

*The global population is gradually increasing and the infrastructure related work are increasing day by day. Continuously earth's finite sources are depleted, and large amount of harmful gases are emitted, so environment pollution and a scarcity of resources are prevalent worldwide.*

*The construction industry has traditionally relied heavily on the extraction and utilization of natural resources. This reliance is due to the production and transportation needs of these materials. Recently, there has been a growing interest in natural fibers, which are both cost-effective and environmentally friendly. In India, farmers often do not utilize materials such as corn straw coconut fiber, sugarcane residue, bamboo waste, and coconut shells, choosing instead to burn them. However, integrating these waste materials into construction could provide a source of revenue for farmers and offer a cost-effective solution for the industry. Coconut fiber is one of the most abundantly available natural fibers in tropical regions. It possesses excellent mechanical properties, making it available material.*

## INTRODUCTION

This study systematically analyzes the properties of natural fibers, with a primary focus on coconut fibers, in terms of sustainable and affordable

Reinforcement material in construction. When used in cement, whether in paste, mortar, or concrete form, coconut fibers can enhance the material's overall properties. According to researcher Abdur Rahman (2023), using these materials in construction projects can yield dual benefits, both environmentally and economically. This utilization can lead to a significant reduction in greenhouse gas emissions from municipalities, as noted by Chen et al. (2018).

The primary goal of this review is to raise awareness about the potential of coconut fibers as a construction material within the field of civil engineering. By highlighting the benefits and applications of natural fibers, this review aims to encourage the construction industry to adopt more sustainable and cost-effective practices.

Incorporating natural fibers like coconut fiber into construction not only provides economic benefits but also contributes to a more sustainable industry. By expanding the use of these materials, we can reduce environmental impact and support local economies, particularly in tropical regions where these fibers are readily available.

Material for local use coconut fibers derived from coconuts are classified into 2 type

Brown fiber and white fiber. Brown fiber is extracted from mature coconuts, while white fiber is obtained from immature coconuts. Each type has distinct characteristics: white fiber is smoother and finer but also weaker, whereas brown fiber is thicker, stronger, and has high abrasion resistance. These fibers are commercially available in three forms: mixed fibers, relatively short fibers, and long fibers.

Typically, steel bars are used for reinforcement in construction, which significantly increases both the cost and weight of structures. Coconut fibers offer a cost-effective and lighter alternative with numerous advantages:

1. *Fungal and Rot Resistance:* Coconut fibers are naturally resistant to fungi and rot, enhancing the durability of the construction materials.
2. *Moth-Proof:* These fibers are resistant to moth attacks, which helps maintain the integrity of the construction overtime.
3. *Excellent Insulation:* Coconut fibers provide superior insulation against temperature and sound, contributing to energy-efficient buildings.
4. *Moisture Resistance:* They are not easily affected by moisture and dampness. Their numerous advantages make them a viable alternative to traditional materials, offering a pathway to more efficient and eco-friendly construction solutions. Concrete is made by mixing cement, water, fine and coarse aggregate and sometimes they are suitable for various environmental conditions.
5. *Tough and Durable:* Coconut fibers are known for their toughness and durability, ensuring long-lasting performance in construction applications.
6. *Resilience:* These fibers can spring back to their original shape even after constant

use, maintaining structural integrity.

7. *Ease of Cleaning:* Coconut fibers are easy to clean, making maintenance straight forward and cost-effective.

### Properties of coconut fibre

The dimensions of individual fiber cells are influenced by various factors, including the species, geographic location, and maturity level of the plant. The flexibility and systematic analysis of coconut fibers highlights their significant advantages in sustainability, compressive strength, and overall construction performance. By leveraging the unique properties of coconut fibers, the construction industry can achieve more sustainable, cost-effective, and durable structures. The future of coconut fibers in construction looks promising, with ongoing research and development paving the way for innovative applications and broader adoption.

By incorporating coconut fibers into construction materials we can significantly reduce environmental impact and promote sustainable practices

Admixture in the right proportion is major construction material, but due to increase the rate of cement it becomes a costly work. And an obstacle for development countries. Cement making process is one of the reasons of greenhouse effect and climate change.

Rupture resistance of the fiber are determined by the length-to-diameter ratio, which also impact the types of products that can be manufactured from the fiber. The pre-treatment of fibers changes the context composition and ultimately change not only the property but also the properties of composition. The size and space of the central hollow cavity, known as the lumen, are influenced by the thickness of the cell wall and the origin of the fiber. This hollow cavity plays a role in providing acoustic and thermal insulation by reducing the fiber's bulk density (Floweretal.,2006, as cited by Faust in Waif elate Bolarinma Oluseun Abiola, 2008).

1. *Reinforced Concrete*: Coir can be mixed with concrete to improve its tensile strength and reduce cracking. The fiber helps in controlling shrinkage and enhances the durability of the concrete.
2. *Geo textiles*: Coir fibers are used to create geo textiles for separation, filtration, and reinforcement in soil stabilization and road construction. These textiles help to prevent soil erosion and improve soil stability.
3. *Composite Materials*: Coir fibers can be used to produce composite materials, which are lighter and more sustainable
4. *Green Roofing*: Coir mats are used in green roofing systems to support vegetation growth and provide insulation. The natural fibers are good at retaining moisture and promoting plant health.
5. *Acoustic Insulation*: Due to its natural sound-absorbing properties, coir can be used in acoustic insulation products to reduce noise in buildings.
6. *Bio-based Construction Materials*: Coir can be combined with other natural materials to create eco-friendly bricks, blocks, and panels for building construction.

### Conclusions

In the field of civil engineering, coconut fiber has been employed as a reinforcement material in composites form on-structural elements. Nevertheless, it is crucial to explore and assess how coconut fiber reinforced concrete behaves when applied to primary structural components like beams and columns.

This discussion delves into the diverse versatility and various applications of coconut fiber. Research

indicates that coconut fibers exhibit significant ductility and are effective at absorbing energy. The potential of coconut fibers to be used indifferent types of composites is evident. Extensive studies on coconut fiber reinforced composite shave already been carried out, demonstrating that they can achieve cost effective and superior results. Despite this, there're mains an opportunity for innovation and the development of new products incorporating coconut fibers, which could lead to even more improved outcomes.

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