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# A review on the mechanical properties of areca fiber reinforced composites

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**Abstract**

Naturally available filaments have recently become attractive to researchers, engineers, and scientists because of suitability as an alternative reinforcement for fiber reinforced polymer composites. Low cost, fairly good mechanical properties, non-abrasive and bio-degradability attributes, abused as a swap for the regular fiber. The tractable properties of normal fiber reinforced composites are mainly influenced by the interfacial adhesion between the matrix and the fibers. In this article survey on biosoftening, adhesion, the effect of fiber length, the effect of chemical treatments of long areca fibers, Influence of mercerization on the tensile strength of long & short areca fibers, areca husk have been discussed.


*Keywords:* Natural composites; Fiber reinforced composites; Areca nut fiber; Mechanical properties; Chemical treatment

## 1. Introduction

The present world is confronting a difficult issue of growing new and propelled innovations and techniques to dispose or make use of solid wastes, especially non-actually reversible polymers. The procedures to break down those squanders are really not savvy and will in this manner create unsafe chemicals. Considering above parameters, strengthening polymers with natural fibers is the only way which will lead us to the solution. Regular strands are minimal effort, recyclable, low thickness, and eco-accommodating materials. Their tensile properties are great and can be utilized to supplant the customary strands, for example; glass, carbon in fortifying plastic materials. A noteworthy disadvantage of utilizing characteristic strands as fortification in plastics is the contrariness, bringing about poor attachment between normal filaments and lattice gums, hence prompt low pliable properties. To enhance fiber-network interfacial holding and improve malleable properties of the composites, some theories and surface modification techniques are developed. Also, it is evidently clear that the strength and stiffness of the natural fiber polymer composites are strongly dependent on fiber loading. The mechanical properties increases with increasing fiber weight ratio up to a certain amount. Mathematical models/finite element models can be used as a compelling instrument to anticipate the tensile properties of natural fiber strengthened composites.

Natural fiber consists of different constituents like cellulose, lignin, pectin and other materials. Because of the presence of these components, natural fiber have special characteristics and special properties and they will result in high moisture percentage & intern this affects the fiber-matrix bonding. To overcome from this difficulty some chemical treatment methods [1–5] are implemented and are studied in order to meet the properties as of other man-made fibers.

The areca/betel nut fiber reinforced composites finds greater advantages in the latest development of composite materials such as electrical insulation applications [6].

The tensile strength is more delicate to the grid properties, though the modulus is reliant on the fiber properties. To enhance the strength [4,6–8] a solid interface, low anxiety fixation, fiber introduction is required, while fiber concentration, fiber wetting in the matrix stage, and high fiber proportion decide elastic modulus.

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# Tensile and flexural properties of areca sheath fibers

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**Abstract**

In the current work, the effect of surface modifications of areca sheath fiber by chemical modifications such as alkylation, permanganate treatment, benzoylation and acrylation on the tensile and flexural behavior of areca sheath was studied. Both the surface modified and raw areca sheath fibers are studied in this investigation. It was found that the tensile and flexural strength are greatly influenced by surface modifications. From this study, it is concluded that chemical treatment of areca sheath will result in increasing the tensile strength and will reduce the bending strength. Further, the tensile strength increases with the surface modification and flexural strength decreases. It is concluded that the composites utilizing areca strands are promising elective materials, which can be effectively utilized in automobiles, packaging industry, parcel/panel boards, and so on


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*Keywords: Areca sheath; Tensile strength; flexural strength; Surface modification;*

## 1. Introduction

The areca nut palm, Areca catechu L. is the source of the common masticatory nut, popularly known as areca nut. Areca is a commercial/profit-oriented crop and is mainly grown southern parts of India [1]. Areca leaf sheath is shed intermittently from the tree and it can be conceivably utilized as dry grub in ruminants. Around four lakh hectares of land is under Areca development and it is evaluated that 500,000 tonnes of the potential availability of areca leaf sheaths annually [2]. Each areca leaf sheath weighs about 250 g and the total annual availability of areca sheath is about 0.14 million tons. Few of the studies have high lightened the measurable quantity of studies on arecanut,


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# Spectral studies on chemically modified single areca fibre*

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**Abstract**

The increase in ecological regulations and the exhaustion of fuel assets has motivated the scientists and researchers to develop polymer composites reinforced with eco-friendly and biodegradable natural fibre. Since, the natural fibre is polar in nature, it results in weak adhesion between the fibre and the polymeric matrix. Consequently, it results in substandard properties to the natural fibre composites. Physical and mechanical properties of natural fibre reinforced polymer composites can be improved by reducing the hydrophilic of natural fibres by suitable chemical modifications, which gives a strong compatibility between the fibre and polymer matrix. In present work, areca fibre were subjected to various chemical treatments such as sodium hydroxide, potassium permanganate, benzoyl chloride and acrylic acid. IR, XRD and TGA-DTG studies of raw and chemically improved areca fibre are discussed



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*Keywords:Areca fibre; chemical modification; IR; XRD; TGA; DTG*



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# Influence of Surface Modification on the Thermal Stability and Percentage of Crystallinity of Natural Abaca Fiber

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***Abstract***

Natural fibers are used as reinforcements in the preparation of composites in order to get superior mechanical properties. But the drawback associated with natural fibers is their low thermal processing temperature, which is around 200 °C. In this work, natural abaca fiber was subjected to various chemical treatments and their influence on the thermal stability and percentage crystallinity of the fibers was studied. Thermogravimetric analysis is used as a method of thermal analysis, in which the weight loss of the material is measured as a function of temperature. The results indicated that the chemical treatments improved the thermal stability of the fibers. X-ray diffraction analysis revealed that the percentage of crystallinity of treated fibers decreased when compared to untreated fibers.

*Keywords:* Thermogravimetric analysis, abaca fiber, chemical treatments, thermal stability, X-ray diffraction, crystallinity

## 13.1 Introduction

Natural fibers as reinforcement in the production of green products are gaining attention of late because of ecological concerns and increasing environmental

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