





# Consequence of silane combination representative on the mechanical possessions of sugarcane bagasse and polypropylene amalgams

M. Chandragowda <sup>a</sup>  , C. Gnanavel <sup>b</sup>, D. Saravanan <sup>c</sup>, D. Stalin David <sup>d</sup>, R. Parthiban <sup>c</sup>, A.S. Rajesh <sup>e</sup>

Show more 

 Share  Cite

<https://doi.org/10.1016/j.matpr.2021.10.455> 

[Get rights and content](#) 

## Abstract

A composite material is created by combining at least two materials to create a unique combination of qualities, one of which comprises stiff, long strands and the other of filaments. And it is mainly concerned with improving ordinary fibre composites to explore the extra possibilities of use. Such typical fibre composites in the accommodation and building areas are suitable as wood alternatives. Many large loads of different yields are supplied, but much of their squandering has no practical use. Horticultural squandering incorporates a variety of dry natural resources and the influence of silane coupling agents on mechanical characteristics like bending strength, tensile strength, and impact intensity in sugar cane bagasse and PP (polypropylene) composites discussed in this Research. The reinforcing material was treated with a 0 percent coupling agent, 10 percent, and 20 percent. This substance was present for the production of composite boards via compression molding. The influence on mechanical parameters such as stress, bending, and impact strengths of the composites were analyzed by the silane coupling agent.

## Introduction

Fibre is not a wise decision to create materials made entirely of ordinary fibres as a substitute for oil-based things. A more feasible arrangement is to combine oil and bio-based assets to create a cost-effective item with a variety of uses. The long-term performance of thermoplastic and thermoset composites based on non-synthetic fibres is being investigated [1]. Intake of moisture, on the other hand, is an issue. The thermodynamic and chemical states of the fibre surface are used to determine fibre–matrix adhesion[2], [3], [4]. Surface treatments are applied to natural substrates to alter their surface area, surface energy, and acid-base properties. The process of chemical modification will improve fibre and matrix contact and bonding[5]. Treatment with alkali and a silane coupling agent was shown to be the most effective technique to promote fibre–matrix adhesion in this circumstance[6].

## Section snippets

## Literature review

Green composites, which are made of recycled or biodegradable polymers and renewable plant resources, have recently piqued researchers' interest due to serious environmental concerns such as rising energy consumption, greenhouse gas exhaustion, fossil fuel depletion, and plastic waste accumulation [1], [2]. PLA is one of the most often utilized raw ingredients in producing green composites [3], [4]. It's a thermoplastic aliphatic polyester with mechanical, thermal, and barrier properties similar ...

## Materials

Sugarcane bagasse was gathered from National co-operative sugar mill, urseri, Tamilnadu. Fig. 1 shows the crushed stalk that was collected.

Cellulose is 45.1 percent, HemiCellulose is 25.6 percent, Lignin is 12.7 percent, other inorganic substance is 4.3 percent, Ash is 8.0 percent, and moisture is 9.7 percent....

## Sugarcane bagasse

As its node division along the cane, the gathered cane was first sliced into multiple pieces. The fibre extraction process from crushed sugarcane residue is shown in Fig. 4....

## Retting

Water retting, which is the most widely used type of retting, was used to ret the sugarcane bagasse by immersing bundles of stalk in water. Fig. 5 depicts the sugarcane bagasse retting process. Water infiltrates the focal tail bit, expanding the inner cells and blasting the furthest layer, boosting dampness and rot...

## Single fibre strength and elongation

The single fibre strength, a typical incentive, was determined using an instron instrument (5500R) with a 15mm fibre length fixed in the portable and fixed cinches provided in the instrument for 25 samples. A magnifying lens that comes with the device detects the mass of the above tightened fibre naturally. Following moulding the sample at the standard temperature and relative stickiness (27°C and 65%), the mean single fibre strength on 25 fibre samples for the crude fibre was estimated using ...

## Tensile strength test

Width: 25mm

Thickness: 3mm

Length: 200mm

Above Fig. 11 shows the Mak Flexural Strength Tester and the Flexural testing determines a material's bending strength, which is stated the load (N)- Length(mm) diagram produced by the flexural test is used to determine the maximum load that the sample can bear. This information is often used to select a material, design components that can handle application loads, and perform material quality checks....

## Sample preparation

Length: 140mm

Width: 25mm

Depth: 3mm

Span Length: 100mm...

## Formula used

F...

## Estimation of lignin and cellulose content

In their chemical makeup in above Table 2 shows, all bast fibres include lignin, cellulose, hemicellulose, and moisture. Lignin is wax content, and if it is present in the fibre, it will diminish the end product's strength, necessitating the use of an alkali treatment on the fibre. The presence of lignin in the fibre will be eliminated as a result of the alkali treatment is shown as below Fig. 12.

A single fibre strength test was performed using an instron device. Due to the removal of lignin in ...

## Tensile strength of bagasse /Polypropylene composites

The impact of the coupling agent on the tensile strength of the bagasse/polypropylene composite is shown in Fig. 16. The tensile strength of the composites is significantly influenced by the presence of coupling agent....

## Results and discussion

Consequently, the decomposition stages may be ascribed to the breakdown of sugar cane bagasse and the temperatures. Some studies have found a reduction in the thermal stability of SBPP composites, which they attribute to lower thermal breakdown temperatures of SB and higher moisture content. This is in contrast to our findings. According to the literature, the silane functionalization most likely resulted in the formation of siloxane bridges between the natural fibres and the rPP in our...

## Conclusion

Fibres like cellulose, as well as their synthetic counterparts, often feature a surface science that is hostile to excellent holding. For a true depiction of the interface, an appropriate combination of diverse methodologies is required. Reasonable surface modification results in improved interfacial quality and, as a result, improved properties. Sugarcane bagasse fibre reinforced polypropylene composites have had their mechanical characteristics improved by chemical treatments. The...

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper....

[Special issue articles](#)   [Recommended articles](#)

---

## References (11)

G. Najafi *et al.*

[“Potential of bioethanol production from agricultural wastes in Iran”, Renewable and Sustainable Energy \(2009\)](#)

P. Rowell, *Advanced Composites Manufacturing*, John Wiley & Sons, 2002, New...

M. Farsi

## Thermoplastic Matrix Reinforced with Natural Fibres: A Study on Interfacial Behavior

S.C. Lee *et al.*

The effect of bagasse fibres obtained (from rind and pith component) on the properties of unsaturated polyester composites

Material Letters (2007)

FAO Statistics. "Major food and agricultural commodities and producers," 2006. Online at <http://www.fao.org> (consulted...

There are more references available in the full text version of this article.

---

### Cited by (0)

---

[View full text](#)

Copyright © 2021 Elsevier Ltd. All rights reserved. Selection and peer-review under responsibility of the scientific committee of the International Conference on Applied Research and Engineering 2021



All content on this site: Copyright © 2024 Elsevier B.V., its licensors, and contributors. All rights are reserved, including those for text and data mining, AI training, and similar technologies. For all open access content, the Creative Commons licensing terms apply.

