Junior Science Communications
Faculty of Applied Sciences, UiTM Shah Alam
https://journal.uitm.edu.my/ojs/index.php/JSC

E-ISSN 2637-0689
Vol 34 2024

Colloquium on Applied Sciences- CAS 2023
17-18 July 2023, Faculty of Applied Sciences, UiTM Shah Alam, Malaysia

Mechanical And Biological Properties of Kenaf-Empty Fruit Bunches Fibre Reinforced (Poly)Lactic Acid (PLA) Polymer Composite

Sharifah Nursyafizah Syed Mohamad[a], Siti Hasnah Kamarudin[a*]

Structured Abstract

Background: The researchers are working on creating an environmentally friendly bio-composite by using kenaf and empty fruit bunches to reinforce PLA polymer. This aligns with the UN's Sustainable Development Goal, addressing waste management and promoting renewable materials for sustainability. PLA, derived from renewable sources, offers cost-effectiveness and eco-friendliness. The hybridization of fibres aims to improve mechanical, biological, and chemical properties, contributing to a more sustainable future.

Methods: The study focuses on developing an eco-friendly bio-composite using kenaf and empty fruit bunches (EFB) with polylactic acid (PLA) as the matrix. The fibres undergo alkaline treatment with 6% NaOH, washed, and dried. The composite is prepared with 15wt% of each fibre and 70wt% PLA using an internal mixer. The samples are pressed at 190°C for 5 minutes. Tensile tests and soil-burial tests are conducted to analyse mechanical and biological properties, respectively. Scanning electron microscopy is used to examine the fractured samples.

Results: The mechanical properties of the bio-composites were evaluated through tensile tests. Pure PLA exhibited the highest tensile strength (37.47 MPa) and modulus (22,658.05 MPa). Incorporating kenaf (KF/PLA) and EFB (EFB/PLA) fibers resulted in lower tensile strength and modulus compared to pure PLA. Hybridizing untreated kenaf and EFB (untreated kenaf/EFB/PLA) led to reduced properties. However, treatment with 6% NaOH improved the adhesion and slightly increased tensile strength and modulus. In the biological properties assessment, all composites exhibited biodegradability in compost soil, with treated kenaf/EFB/PLA showing the highest degradation rate. SEM micrographs confirmed good fiber-matrix adhesion in the hybrid composites.

Conclusion: In conclusion, the study focused on developing eco-friendly bio-composites using kenaf and empty fruit bunches (EFB) reinforced with polylactic acid (PLA) polymer. The addition of natural fibers resulted in lower tensile strength and modulus compared to pure PLA. However, the composites demonstrated biodegradability in compost soil, with treated kenaf/EFB/PLA showing the highest degradation rate. Scanning electron microscopy confirmed improved fiber-matrix adhesion in the hybrid composites. While the mechanical properties were compromised, the composites showcased potential for sustainable applications in environmentally sensitive contexts.

Keywords: Bio composite, kenaf, empty fruit bunch, PLA

*Correspondence: sitihasnahkam@uitm.edu.my

[a]School of Industrial Technology, Faculty of Applied Sciences, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia.