ICSBE 2025

The Kandy Conference

The 16th International Conference on

Sustainable Built Environment 2025 and Next-Gen Innovation & Advancement (DIAMOND 75)

BOOK OF ABSTRACTS

Editors
Prof. Ranjith Dissanayake | Dr. Pradeep Gajanayake

ICSBE25_179

SYNTHESIS AND CHARACTERIZATION OF SUSTAINABLE PAPER MATERIAL FROM LEAF STALK FIBER WASTE OF *Borrasus flabellifer L.*

S. Vinothisha[1], T. Kirushanthi[2*], A.M.W.K. Senevirathna[1], M.P. Charithangi[1]
[1]Department of Export Agriculture, Faculty of Animal Science and Export Agriculture, Uva Wellassa University, Passara Road, Badulla, 90000
[2]Palmyrah Research Institute, Palmyrah Development Board, Kandy Road, Kaithady, Jaffna, 40000
**Correspondence E-mail: kirushvel23@gmail.com, TP: +94775185853*

Abstract: The leaf stalk of Palmyrah (*Borassus flabellifer L.*) is traditionally used to produce hard fibers for manufacturing heavy-duty brushes, particularly for marine ship cleaning. However, this process generates substantial fiber waste, which is typically discarded in landfills, posing environmental and health concerns. This study aims to convert Palmyrah Leaf Stalk Fiber (PLSF) into a sustainable paper material. Initially, the PLSF was soaked in water for two days and then subjected to separate chemical treatments: alkali treatment using NaOH and bleaching treatment using H_2O_2, each in varying concentrations (T1 = 5% NaOH, 3% H_2O_2; T2 = 5% NaOH, 5% H_2O_2; T3 = 10% NaOH, 3% H_2O_2; T4 = 10% NaOH, 5% H_2O_2) at 60 °C for 45 minutes to remove impurities and bleach the fibers. The treated fibers were characterized using FTIR spectroscopy. FTIR characterization of treated PLSF depicted that the fibers were successfully treated, confirming the removal of non-cellulosic components. Paper pulp was prepared by mixing water with each treated PLSF sample, and 0.2% gelatin was added as a binding agent. Handmade paper was produced using a screening mesh. The physical and chemical properties of the resulting papers—such as tensile strength, thickness, balanced grammage, total ash content, moisture content, opacity, and pH were evaluated using standard analytical methods. Among the four samples, Sample T3 demonstrated the best overall performance, exhibiting the highest tensile strength (1.51×10^{-3} MPa), thickness (0.051 mm), balanced grammage (96.47 grams per square meter- gsm), total ash content (9.62%), moisture content (13.31%), acceptable opacity (85%), and acceptable pH (7.15) and making it the most promising candidate for quality paper applications. This study presents a sustainable approach to waste valorization, adding value to the Palmyrah industry. Future work should focus on enhancing paper quality through the use of advanced technologies.

Keywords: Bleaching; Palmyrah; Paper; Stalk Fibre; Sustainable