

EXPERIMENTAL AND NUMERICAL STUDY OF TENSILE TESTING OF COCONUT FIBER (COCOS NUCIFERA) COMPOSITES

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ABSTRACT

The development of engineering materials has encouraged the use of lightweight, strong, and environmentally friendly composites, one of which is coconut fiber (Cocos nucifera)-based composite material. This study aims to analyze the mechanical properties of the composite through experimental tensile testing and numerical simulation, as well as to validate the results between both methods with variations in fiber orientation. The research method was carried out through tensile testing of composite specimens in the laboratory and numerical simulation using the Finite Element Analysis (FEA) method with ANSYS software. The main parameters analyzed were tensile stress and strain. The results show that fiber orientation affects the tensile strength of the composite material. The average tensile stress for the 0°/90° orientation is 7.855 MPa with a strain of 0.82%, while for the 45°/135° orientation it is 8.947 MPa with a strain of 1.08%. The numerical simulation results are in good agreement with the experimental data, with error values of 12.61% and 7.85%, respectively, which are still within the acceptable validation limit of 15%. Therefore, the numerical method can be used to predict the mechanical behavior of coconut fiber-based composites, and the 45°/135° fiber orientation provides more optimal tensile strength compared to the 0°/90° orientation.

Keywords: composite, coconut fiber, tensile test, FEA, ANSYS, validation