Tensile and Flexural Properties of Water Hyacinth (*Eichhornia crassipes*) Fibre Reinforced Thermoplastic Composite

N.A.K. Aloka[1,2], R.A. Jayasinghe[1*], A.H.L.R. Nilmini[3], and G. Priyadarashana[3]

[1]Department of Civil and Environmental Technology, Faculty of Technology, University of Sri Jayawardena, Pitipana, Homagama, Sri Lanka.
[2]Faculty of Graduate Studies, University of Sri Jayewardenepura, Sri Lanka.
[3]Department of Materials and Mechanical Technology, Faculty of Technology, University of Sri Jayawardena, Pitipana, Homagama, Sri Lanka.

[*]*randika@sjp.ac.lk*

Natural fibres are the primary substitute for synthetic fibres because natural fibres have a lower environmental impact. The water hyacinth (*Eichhornia crassipes*) is an aquatic weed that spreads and covers up surface water bodies within a short period of time. This plant's spread has a negative impact on the ecosystem. However, these plants can be used as a fiber source for many applications. The natural fibres from the water hyacinth stem were investigated as a reinforcing phase in a Polyethylene (PE) matrix. Polyethylene material was collected as waste packaging material from an industry. FTIR and DSC analysis revealed that the material is a blend of LDPE and LLDPE. The water hyacinth fibres (WHF) were extracted by a decorticating process. Water hyacinth fibres were added to the PE matrix at a rate of 5, 7.5, 10, and 12.5 w/w%. A compression moulding technique was used to manufacture the composites. The panels were developed without using any chemical additives. Tensile strength and flexural strength tests were conducted for prepared composites according to ASTM D 638 and ASTM D 790, respectively. The 5% WHF composite showed maximum tensile strength and young's modulus of 8.4 MPa and 5.6 MPa, respectively. However, the control sample (0% WHF) exhibited a higher tensile strength of 12.8 MPa compared to the composite reinforced with 5% WHF. The flexural strength and flexural modulus decreased up to 7.5% of WHF reinforcement weight in the composite and then increased gradually. The 12.5% of WHF exhibited the highest levels of flexural strength and flexural modulus, measuring 10.1 MPa and 210.5 MPa, respectively. The composite reinforced with 12.5% weight of reinforcing material demonstrated superior flexural properties compared to the control sample. However, the composite reinforced with 5% WHF demonstrated acceptable mechanical properties based on the overall experimental findings.

Keywords: Composite, Flexural Strength, Polyethylene, Tensile Strength, Water Hyacinth