

Tensile Properties of Luffa Acutangula Reinforced Polymer Composite

Christopher Joyle Indor¹, Hoo Tien Nicholas Kuan^{1*}, Freddy Kuok San Yeo², Mohd Khairul Afiq¹

¹Department of Mechanical Engineering, Faculty of Engineering, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, MALAYSIA

²Department of Agrotechnology, Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, MALAYSIA

*Corresponding Author

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Abstract: In recent years, there has been a growing trend in the popularity of natural fiber-reinforced polymer composites (NFRPC). Numerous researchers have put forward various alternatives to synthetic fibers. Luffa is one of the many natural fibers can be integrated into NFRPCs. Luffa with its unique interconnecting branch (mat/mesh) is suitable for NFRPCs. In this study, luffa reinforced high-density polyethylene (Luffa/HDPE) composite was fabricated using compression molding machine. In the preparation of the fiber, Luffa were cylindrically cut-out and opened into sheets form. The fiber was then laminated with high-density polyethylene (HDPE) film using compression molding method. The proposed fabricated composite consisting of a fiber volume fraction (FVF) of 7%, 14%, 21%, 27% and 30%. Tensile properties of the Luffa/HDPE composite were determined. SEM was used to study the interlamination and delamination of the composite. Tensile test shows that the increase of FVF enhanced the tensile strength of Luffa/HDPE composite. Tensile strength has gradually increased from 7 % to 21 % FVF. Though, tensile strength declines after 21% FVF.

Keywords: Natural fiber, tensile, Luffa, NFRP

1. Introduction

In this study, Luffa was used as fiber reinforcement in the natural fiber reinforced polymer composite (NFRPC). Current trends in the composite industry suggest the replacement of synthetic fibers for natural fiber as it is safer for human health and environment. The cost to produce NFRPC is far economical compared to synthetic fibers. A study carried out in 2013 shows that when synthetic cotton was manufactured, the synthetic fiber cause irritations and in the long term induce lungs and skin cancer to the workers [1]. Plastic waste is a problem to the environment. Since 2018, 3,300 metric tons were dumped on daily basis in this country. The waste consists of 45 % organic and food waste, while plastic took up 13 % of the statistics. Despite the recycling awareness, only 17.5 % of citizens recycled their waste [2].

Luffa acutangula or *Luffa cylindrica* has been known to be a type of vegetable, it has been more of a remedy for gastric and diabetes for some cases [3]. It can be grown in all-warm weather countries and mostly found in Asia. Some other warm weather countries have been commercializing luffa and mostly used for replacing dish washing sponge, bath scrub and shoe insole. Currently, studies have made on chemical constituents, aging and, structural and mechanical properties [4-6]. A tensile test study was done on luffa fiber itself ranges between 10 MPa to 50 MPa. Due to the high specific strength of luffa, it can be used as a good fiber reinforcement material [7,8]. The aim of this study is to investigate the tensile properties of Luffa/HDPE composite.

*Corresponding author: khtnicholas@unimas.my

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