

Determination of tensile properties for twisted fibre bundles of oil palm empty fruit bunch at different diameters

ABSTRACT

The potential use of natural fibre extracted from oil palm empty fruit bunches has gained wide attention among researchers. This natural fibre comes from fibrous strands which form fibre bundle after shredding process at a mill. The measurement of tensile properties is important to understand the mechanical performance of this fibre bundle. This study was undertaken to determine the tensile properties of the fibre bundle from oil palm empty fruit bunch (OPEFB). Fibrous strands of the OPEFB extracted from shredded empty fruit bunches were twisted to form fibre bundle specimens at different diameters varying from 1 to 5 mm. The tensile properties measured in this study including tensile strength, tensile load and tensile modulus. The measurements were performed using Instron Universal Test Machine (IUTM) model 5000. From the results, it was found that the specimens at 1 and 5 mm in diameter required 71.25 and 429.68 N of the tensile load to break, respectively. The specimen with 1 mm in diameter recorded the highest tensile strength of 90.72 MPa while the specimen with 5 mm in diameter recorded only 21.88 MPa. The highest tensile modulus with value of 662.50 MPa was obtained from the specimen with 1 mm in diameter while the specimen with 5 mm in diameter had the tensile modulus value of 157.47 MPa. It was also found that the tensile strength and tensile modulus decreased when the diameter of the specimens increased. The findings reported in this study can serve as an engineering basis for the design specification in the development of the future in-silo composting machine.

Keyword: Tensile properties; Oil palm; Fibre; Empty fruit bunch; Diameter