

Special Issue


Sustainable Construction Engineering

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Research Article | Open Access

Volume 2021 | Article ID 9422352 | <https://doi.org/10.1155/2021/9422352>[Show citation](#)

Impact of Addition of Banana Fibres at Varying Fibre Length and Content on Mechanical and Microstructural Properties of Concrete

Rodgers B. Mugume ¹, Adolph Karubanga,¹ and Michael Kyakula¹¹Department of Civil and Environmental Engineering, Kyambogo University, Kampala, P.O. Box, 1, Kyambogo, Uganda[Show less](#)

Academic Editor: Rahul V. Ralegaonkar

Received
14 Apr 2021Accepted
30 Sep 2021Published
08 Oct 2021

Abstract

This experimental study aimed at investigating the impact of addition of banana fibres on the mechanical (compression, splitting tension, and flexure) and microstructural (microscopic morphology and Energy Dispersive X-ray Spectroscopy) properties of concrete. Concrete mixes comprising of banana fibres of varying fibre lengths (40, 50, and 60 mm) and fibre contents (0.1, 0.2, 1.0, 1.5, and 2.5%) were assessed. Addition of banana fibres to concrete was observed to significantly impact on compressive strength only at lower fibre contents of up to 0.25% for all fibre lengths. Fibre length had no significant impact on compressive strength at lower fibre contents of up to 0.25%, but shorter fibres were observed to perform better than longer ones at higher dosages more than 0.25%. Increase in fibre content positively impacted on tensile strength of concrete at relatively lower fibre dosages of up to 1%. Similarly, fibre length impacted on tensile strength of concrete at lower fibre contents of up to 1% and, longer fibres were observed to be more effective than shorter ones. Addition of banana fibres generally did not greatly contribute to flexural strength of concrete but had a marginal impact only when shorter fibres were used at lower fibre dosages. Also, microstructure of concrete was improved through better bonding between the fibres and the matrix and reduction in porosity of the matrix, which resulted in improved mechanical properties of the composite. Banana fibres further contributed to changes in phases of the composite structure of Banana fibre-reinforced concrete (BFRC) through a reduction in its interplanar spacing and



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