

Development of a Bioplastic Composite as an Alternative for the Conventional Plastic Packaging for Set-Yoghurt

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The current study was aimed at developing a bioplastic composite using banana (*Musa* spp.) pseudostem (BP), cassava (*Manihot esculenta*) starch and polyvinyl alcohol (PVA), along with plasticizers to replace the plastic packaging for set-yoghurt and identifying the ideal composition to develop the biocomposite. Banana pseudostems of different cultivars (Sour Plantain, Sugar Plantain, Ash Plantain, *Suwandel* and *Rath Kesel*) were used in the preparation of the biocomposite using the solvent casting method. The proximate analysis, Acid Detergent Fiber (ADF), Neutral Detergent Fiber (NDF) and lignin tests revealed no significant differences ($P>0.05$) in proximate and van Soest constituents among the cultivars. Suitability of incorporating lignocellulosic components as 10%, 15%, 20%, 25%, 30%, 35% and 40% (w/w) was tested using PCS10, PCS15, PCS20, PCS25, PCS30, PCS35, PCS40 and using PCA10, PCA15, PCA20, PCA25, PCA30, PCA35, PCA40 (w/w) treatments respectively for Sour and Ash Plantain cultivars selected based on texture analysis of biocomposites. The bioplastic films were evaluated for the mechanical, chemical, thermal, water absorption, gas permeability and morphological properties. Tensile strength evaluation resulted lower ($P<0.05$) values for PCS25 (1.84 ± 0.08 MPa) and PCA25 (1.26 ± 0.15 MPa) compared to all other treatments. Elongation at break percentages were lower ($P<0.05$) for the same samples compared to all other treatments, with the values of $12.34\pm1.69\%$ and $3.26\pm0.78\%$ respectively. Water absorption percentage at 24 h increased with the lignocellulosic component, recording the highest ($P<0.05$) value ($88.61\pm1.32\%$) for PCS40 biocomposite film. Gas permeability decreased as the percentage of banana pseudostem increased, resulting the highest ($P<0.05$) amount ($21.16\pm0.13\%$) for the PCA10 biocomposite film. Finally, it is concluded that biocomposite with 30% BP incorporation from Sour Plantain or Ash Plantain could provide ideal composition to produce biodegradable packaging for set-yoghurt.

Keywords: Banana pseudostem, Biodegradable composite films, Cassava starch, Food packaging, Polyvinyl alcohol

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