Novel polylactic acid (PLA)-based active packaging with incorporation of nanoparticles and its performance throughout shelf-life of fresh-cut fruit [O3/05]

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This study aimed at developing innovative and environmentally friendly packages for fresh-cut fruits and at a better understanding their effect on physicochemical, mechanical and microbiological characteristics during shelf-life. Packages were developed under the scope of EU project SusFoFlex (7th framework programme) – thought to incorporate materials in final packaging formulations complying environmental and sustainability concerns and valorisation of agri-food by-products. Polylactic acid (PLA)-based active packaging formulations differed in nanoclays used and presence/absence of a surfactant. PLA-nanocomposite packaging performance was evaluated and compared with pristine-PLA and conventional polyethylene terephthalate (PET). Polyone was used as plasticizer in PLA packages. PET formulation did not include any nanoclay. Fresh-cut melon was selected as food model to assess PLA packaging formulations performance on quality changes taking place throughout 7-d storage under controlled conditions. Physicochemical and textural analysis over time encompassed weight loss, colour, visual appearance, pH, soluble solids and firmness, whereas microbial enumeration covered vegetative mesophilics and psychrotrofics, Gram- rods, nonsporing Gram+ rods and cocci, yeasts and moulds. Environmental impact of PLA-based packaging was evaluated via life cycle assessment (LCA) and compared with PET. Under limit storage conditions, all microbial groups exhibited maximum viable counts after 5-d. *Pseudomonas aeruginosa* and *Escherichia coli* were absent, and refrigeration proved to effectively reduce microbial activity. Overall inspection of dataset throughout storage, unfolded that nanoclays and surfactants in PLA formulations improved their performance, thus contributing to bring together the characteristics of both biopolymers (PLA and PET). Finally, LCA impact assessment indicated that PLA packaging with nanoclays had the highest environmental performance.

Keywords: Packaging, polylactic acid (PLA), ready-to-eat fresh-cut fruit, physicochemical/microbial properties, life cycle assessment (LCA)

SPB 2016

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SPB2016

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UNIVERSITY OF MINHO

GUIMARÃES

SPB2016 Book of Abstracts

Published by

SPB – Sociedade Portuguesa de Bioquímica
Universidade de Coimbra
Departamento de Bioquímica
Apartado 3126
3001 - 401 Coimbra, Portugal

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Editor: Miguel Pinheiro
Proofreader: Lina Kakoulidou
Editing Services: SY4SCI Events, Lda.
Production Services: Copissaurio, Lda.

Interior Designer: Miguel Pinheiro
Cover Designer: Tomás Capa
Illustrator: Tomás Capa

November 2016: First edition (Print)
December 2016: Second edition (Web)

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