

Effect of pomegranate peels and extract in barrier, optical and mechanical properties of polylactic acid-based active packaging

Mariana A. Andrade^{1,3,4}, Fernanda Vilarinho^{1,*}, Pedro V. Rodrigues², Carolina Barros², Vasco Cruz², Ana Vera Machado², , Cássia H. Barbosa^{1,5}, Fernando Ramos^{3,4}, Ana Sanches Silva^{3,6,7,8}

¹ Department of Food and Nutrition, National Institute of Health Dr Ricardo Jorge, Av. Padre Cruz, 1649-016 Lisbon, Portugal

² Department of Polymer Engineering, Institute for Polymers and Composites (IPC), Campus de Azurém, University of Minho, 4804-533 Guimarães, Portugal

³ University of Coimbra, Faculty of Pharmacy, Coimbra, Azinhaga de Santa Comba, 3000-548 Coimbra, Portugal

⁴ REQUIMTE/LAQV, R. D. Manuel II, Apartado, 55142 Oporto, Portugal

⁵ METRICS, Department of Chemistry, NOVA School of Science and Technology, NOVA University of Lisbon, Caparica Campus, 2829-516 Caparica, Portugal

⁶ National Institute for Agricultural and Veterinary Research (INIAV), I.P., Rua dos Lagidos, Lugar da Madalena, Vairão, 4485-655 Vila do Conde, Portugal

⁷ Center for Animal Science Studies (CECA), ICETA, University of Oporto, 4501-401 Oporto, Portugal

⁸ Associate Laboratory for Animal and Veterinary Sciences (AL4AnimalS), 1300-477 Lisbon, Portugal

[*fernanda.vilarinho@insa.min-saude.pt](mailto:fernanda.vilarinho@insa.min-saude.pt)

Being more than 50 % of pomegranate (*Punica granatum* L.) constituted by non-edible parts, namely peels (50%) and seeds (10%), pomegranate is an excellent source of by-products. Its peels and seeds present excellent antioxidant and antimicrobial activities and a high content of phenolic compounds, namely ellagitannins.

This work aimed to evaluate the mechanical and optical properties of two polylactic acid (PLA)-based active packaging with 3 wt.% pomegranate peels (3PP) or 3 wt.% pomegranate peel extract (3PPE). All the samples were produced on a laboratory scale with techniques and processing conditions used in industry. The production of packaging with flexible films is mainly carried out by tubular film extrusion. With this processing method it is possible to produce samples with molecular orientation and reduced thickness equal to that of the packages currently on the market. The structural and morphological characterization of the films were evaluated by FTIR and SEM, and the color by UV-vis. Water vapor transmission and mechanical properties were also measured. The color was measured by Shimadzu UV2401PC reflectance spectrophotometer. Water vapor transmission, oxygen permeability and mechanical properties were also measured.

The FTIR and SEM results indicate the incorporation of the pomegranate peels and peels extract in the PLA matrix, where PLA/3PPE showed better particle homogenization than the PLA/3PP. Regarding the color variations, the PLA/3PPE presented higher variations in terms of L*, a*, and b*. The incorporation of pomegranate derivatives has a negative effect on the tensile strength and Young modulus, but a significant increase of the elongation at break for PLA/3PPE. The PLA film's water vapor barrier properties do not suffer any alteration with the incorporation of pomegranate extract.

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