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Characterization of Biodegradable Films Based on Cellulose Derivatives, Pectin and Essential Oil

Mariana Spinei, Mircea Oroian and Vasile-Florin Ursachi

Faculty of Food Engineering, Stefan cel Mare University of Suceava, Suceava, Romania

Abstract

Synthetic polymers have caused ecological problems because they are not fully biodegradable, generating huge quantity of waste which can be noxious to humans and the environment. Environmentally conscious people are therefore looking for better properties and availability in packaging materials which do not pose health or other environmental concerns and provide alternatives to conventional non-biodegradable materials. Films are composed of starch, cellulose, chitosan and gums which are commonly studied by means of their good mechanical and barrier characteristics against different gases (e.g., oxygen). Pectin, an inexhaustible polysaccharide (utilised in the food production as a gelling, stabilizing, thickening and encapsulating agent), is a polymer with major potential for future development. The aim of the current work was to produce films from citrus pectin, cellulose derivatives (carboxymethyl cellulose – CMC, hydroxypropyl methyl cellulose – HPMC, and 2-hydroxyethyl cellulose – 2-HEC) and essential oil extracted from bee bread using glycerol as plasticizer, to determine the mechanical properties (tensile strength and elongation at break), thickness, and physicochemical properties (FT-IR characterization, opacity and colour parameters) of obtained films. The elongation at break and thickness of the films depended on the type of cellulose derivative used for each film formulation, the HPMC film had the highest value of thickness (86.1 mm), while the CMC and 2-HEC films had approximatively the same thickness (62.1 and 65.1 mm, respectively). The highest elongation at break (12.57%) was identified for HPMC film, while the lowest value (8.89%) for CMC. The FT-IR spectrum of the HPMC film exhibited two characteristic absorption bands at 3457 and 1048 cm^{-1}, which were attributed to the hydrogen bonding and bending vibration of C–O, respectively. On the other hand, FT-IR spectra for CMC film indicated peaks at 3301 cm^{-1} due to O–H stretching and inter/intramolecular hydrogen bonds, and at 2905 cm^{-1} caused by C–H stretching, while FT-IR spectrum for 2-HEC presented peaks at 2922 and 1639 cm^{-1} which were attributed to C–H and C=O stretching, respectively.

Keywords: biodegradable films, cellulose derivatives, pectin, essential oil

References

1. Gouveia, T. I. A., Biernacki, K., Castro, M. R. C., Gonçalves, M. P., & Souza, H. K. S., 2019. A new approach to develop biodegradable films based on thermoplastic pectin. Food Hydrocolloids, 97, 105175. https://doi.org/10.1016/j.foodhyd.2019.105175
2. Singhal, S., & Hulle, N. R. S., 2022. Citrus pectins: Structural properties, extraction methods, modifications and applications in food systems - A review. Applied Food Research, 2(2), 100215. https://doi.org/10.1016/j.afres.2022.100215

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