

Characterization of semi-refined carrageenan reinforced with cellulose nanofiber incorporated α -tocopherol for active food packaging applications

*Wan Amnin Wan Yahaya, Raja Nurliyana Raja Ahmad, Nurul Aini Mohd Azman**
Faculty of Chemical and Process Engineering Technology, University Malaysia Pahang,
Lebuhraya Tun Razak, Kuantan, Gambang, 26300, Pahang, Malaysia

ABSTRACT

This work focuses on the development of biodegradable active films packaging using natural compounds by reducing the plastic waste to environment but also as a potential substitute of synthetic preservative in food. Active film packaging was formulated using semi-refined carrageenan (SRC) biopolymer plasticized with glycerol (G), reinforced with different concentrations cellulose nanofiber (CNF) at 0 to 13% w/w incorporated 0.4% w/w α -tocopherol as natural antioxidants. Physical and mechanical properties of the film samples were analyzed. Active films reinforced CNF enhanced overall the tensile strength and the value of elongation at break significantly ($p < 0.05$). Film samples reinforced with 10% w/w CNF improved the value of opacity, thickness, films solubility (%) and moisture content (%) with (5.60 ± 0.14 , 0.139 ± 0.02 , 27.89 ± 2.41 and 18.88 ± 1.06) respectively. In summary, an active film with 10% w/w CNF showed highest improvement on the mechanical and physical properties due to the uniform dispersion between CNF-SRC matrix interactions. Hence, the new formulation of active packaging film with showed competitive properties that could be an alternative solution for biodegradable films with function of food protection against oxidative degeneration.

KEYWORDS

Active packaging films; Antioxidant; Cellulose nanofiber; Semi refined carrageenan; α -Tocopherol

REFERENCES

1. N. Benbettaieb, T. Karbowskiak, S. Bornaz, F. Debeaufort, Spectroscopic analyses of the influence of electron beam irradiation doses on mechanical, transport properties and microstructure of chitosan-fish gelatin blend films, *Food Hydrocolloids*, 46 (2015) 37-51. DOI: 10.1016/j.foodhyd.2014.09.038
2. D. K. Takma, F. Korel, Active packaging films as a carrier of black cumin essential oil: Development and effect on quality and shelf-life of chicken breast meat, *Food Packaging and Shelf Life*, 19 (2019) 210-217. DOI: 10.1016/j.fpsl.2018.11.002

3. K. H. A. Hamid, W. A. W. Yahaya, N. A. Z. M Saupy, M. P. Almajano, N. A. M. Azman, Semi-refined carrageenan film incorporated with α -tocopherol: Application in food model, *J. Food Process. Preserv.* 43(5) (2019) e13937. DOI: 10.1111/jfpp.13937
4. A. Farhan, N. M. Hani, Characterization of edible packaging films based on semi-refined kappa-carrageenan plasticized with glycerol and sorbitol, *Food Hydrocolloids*, 64 (2017) 48-58. DOI: 10.1016/j.foodhyd.2016.10.034
5. E. Sogut, A. C. Seydim, Development of Chitosan and Polycaprolactone based active bilayer films enhanced with nanocellulose and grape seed extract, *Carbohydr. Polym.* 195 (2018) 180-188. DOI: 10.1016/j.carbpol.2018.04.071