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Development and mechanical properties of edible films based on nanocomposites of guava puree and nanoparticles

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Abstract – This work was carried out to evaluate effects of chitosan nanoparticles (NPs) on tensile properties of guava puree edible films. The film-forming solutions were prepared by mixing guava puree with aqueous solutions hydroxypropyl methylcellulose (HPMC) and NPs with 110 nm. The guava edible films was prepared using the ratio 3/97 (HPMC/(guava-NPs)). Mechanical properties results demonstrated the reinforcing effect of NPs. The guava puree edible films also maintained their aroma for long time. Additional studies are in progress in order to obtain further information concerning the permeability of the films.

A relatively new film-forming edible materials are the fruit purees, whose potential to produce edible films has been the subject of some studies in the last years [1]. The application of fruit purees as film-forming materials is related to the presence of polysaccharides, such as pectin and cellulose derivatives, in the fruit puree composition. More cellulose derivatives may be incorporated into the film-forming solution to act as a film-forming aid, improving mechanical properties of films [2]. Polymer nanocomposites are also known as polymers that have been reinforced with small quantities of nano-sized particles. Our studies support the hypothesis that mechanical properties of biodegradable film can be significantly improved through application of nanotechnology. The aim of the present work is to study in guava puree films, the effect of addition of nanoparticles made using CS on Tensile Strength (TS) and % Elongation (%E). CS nanoparticles (NPs) with diameter of 110 nm were produced by polymerization of methacrylic acid (MAA) in CS solution [3]. The films were prepared using HPMC, guava puree and NPs. After the solutions of films prepared were placed on a glass surface at room temperature and let dry for 24 h. Transparent, flexible, homogeneous, surface smooth films without pores and cracks were obtained after drying the film-forming solutions. The films presented characteristic aroma of guava puree, and this aroma continue to long time. Only guava puree is a solution impossible to utilize in film-forming, the film is fragile. Mechanical properties results demonstrated the reinforcing effect of HPMC and CS nanoparticles in the films (Table 1). This effect is attributed the NPs filled the empty spaces of the porous HPMC/guava puree matrix, increasing the collapse and reduction of pores in the films. When only HPMC was included in the guava puree the film present tensile strength of 5.46 ± 0.24 MPa. In other matrix was included HPMC and NPs, the tensile strength of the puree films are increased significantly to 10.68 ± 0.40 MPa. The percentage elongation also increases when NPs are included in films improving the tenacity. The addition of HPMC in puree films facility the film formation and the addition of NPs increase the mechanical properties. In conclusion, films with aroma of guava and improved mechanical properties were formed.

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Table 1: Mechanical properties of guava puree film.

Material	Tensile Strength (MPa)	(%) Elongation
Guava puree	Without film	Without film
Guava puree/HPMC	5.46 ± 0.24	7.10 ± 0.18
Guava puree/HPMC/NPs	10.68 ± 0.40	12.00 ± 0.50

References

[1] H. M. C. Azeredo, L. H. C. Mattoso, D. Wood, T. G. Williams, R. J. Avena-Bustillos and T. H. McHugh, Journal of Food Science, 74, 5 (2009) p. 31-35.
[2] T. H. McHugh and E. Senesi, Journal of Food Science, 65, 3 (2000) p. 480-485.
[3] M. R. de Moura, F. A. Aouada and L. H. C. Mattoso. Journal of Colloid and Interface Science, 321, 2 (2008) p. 477– 483.