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Antimicrobial and antioxidant activities of quercetin-chitosan based edible films**Marthyna Pessoa Souza^{1,2}, Antônio Fernando Vaz¹, Miguel Ângelo Cerqueira², Antônio Augusto Vicente², Maria das Graças Carneiro-da-Cunha¹**¹Departamento de Bioquímica, Universidade Federal de Pernambuco-UFPE, PE, Brazil; ²Institute for Biotechnology and Bioengineering-IBB, Centre of Biological Engineering, Universidade do Minho, Braga, Portugal

Contamination by pathogenic microorganisms and oxidative reactions are two of the main causes of deterioration and loss of freshness in perishable foods. Edible films can be used to maintain the quality and extend the shelf life of food products. Recently, there has been a renewed interest in food packages based on natural macromolecules due to the concerns about the environment and the need to reduce the amount of disposable packaging materials. Chitosan, as the most abundant naturally occurring amino-polysaccharide, is a very promising biopolymer because of its unique physicochemical characteristics, biodegradability and antimicrobial activities. Quercetin is one of the most potent antioxidant molecules of plant origin being its antioxidant activity higher than other well-known antioxidant molecules. The association of natural antioxidants and bioactive biopolymers as chitosan may be particularly useful to develop active food packaging with enhanced properties. In this context, the aim of this work was to develop an active chitosan-based film with quercetin incorporated. The film-forming solutions were prepared with chitosan concentrations of 1.0 % (w/v) in lactic acid solution (1.0 % (v/v)) without and with quercetin (200 µg mL⁻¹). The antioxidant activity of quercetin-chitosan based films was measured using the 1,1-diphenyl-2-picrylhydrazyl (DPPH) scavenging activity method. The antimicrobial activity of quercetin, chitosan and quercetin-chitosan based film-forming solution was evaluated against, *Escherichia coli*, *Shigella sp*, *Proteus mirabilis*, *Morganella sp*, *Micrococcus luteus*, *Staphylococcus epidermidis* and *Bacillus subtilis* using the agar diffusion method. The quercetin-chitosan based films showed the strongest DPPH radical scavenging activity with an initial rate of DPPH consumption of 4.06±0.32 mol min⁻¹. Agar diffusion assay revealed bioactivity against all tested bacteria, with zone of inhibition ranging from 21.00±1.00 to 25.33±1.52 mm for chitosan film-forming solutions; quercetin solution alone showed no inhibitory effect on the growth of the microorganisms tested. However, the antimicrobial effects against all gram-negative bacteria were increased ($p < 0.05$) in the association of chitosan and quercetin, allowing the elaboration of edible films with strong antioxidative and antimicrobial activities. This work suggests a significant potential in the application of chitosan-based edible films containing quercetin to enhance the safety of foods.