INTERACTIVE POLYPHENOLS-BASED BIOPACKAGING FOR FOOD PRESERVATION: AN *IN VITRO* STUDY

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Producing green, sustainable and renewable materials is one of the major challenge nowadays in the food-packaging sector. In this context, the aim of our study is to develop an active cellulose-based packaging, cellulose in fact is one of the most plentiful polymer on the earth. Tetrahydrocurcumin (THC), a derivative of curcuma, chosen as antioxidant and antimicrobial natural substance, was added into a cellulose matrix (1.5% w/w) and the resulting material was then studied. In addition to this active compound, the paper also contained chitosan and carboxymethylcellulose, to improve the retention of THC and the mechanical properties. Mechanical, chemical and microbiological analyses were done to completely characterize the active papers. Grammage, dry and wet strength were determined. The polyphenol content was determined by the Folin-Ciolcalteu method. Antimicrobial activity of THC, in solution and after its incorporation into the papers, was tested against Gram negative bacteria (*Escherichia coli* and *Pseudomonas putida*), Gram positive bacteria (*Staphylococcus aureus* and *Listeria innocua*) and moulds (*Penicillium chrysogenum* and *Aspergillus niger*). Antioxidant capacity was also tested through the DPPH method. THC solution presented a good antioxidant capacity: it showed an EC50 equal to 4,49 ppm (EC50 of Trolox was 2,86 ppm). Its minimal inhibitory concentration is 0,4 g/L for Gram positive bacteria, and higher than 0,6 g/L for Gram negative. THC solution was found effective in delaying the development of moulds. THC polyphenols were quantified as 0,8% on paper weight for the paper containing THC and these quantities together with chitosan resulted able to slow down the growth of microorganism. *Pseudomonas* is inhibited by the presence of chitosan and THC is able to amplify the antimicrobial activity of chitosan, by inhibiting also the growth of *Staphylococcus* and *E. Coli*. The presence of THC does neither affect the mechanical properties of papers, nor the color and the odor. Based on these results, it is possible to conclude that THC exhibits good antioxidant and moderate antimicrobial properties. Paper sheets didn't lose their mechanical properties. These data will pave the way to the use of THC for the production of an active paper-based packaging to improve the shelf life of food items.