

MICROBIOLOGICAL ANALYSIS AND THE ANTIOXIDANT CAPACITY OF EDIBLE BIOFILMS ENCLOSING *BACILLUS SUBTILIS*

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Abstract

The aim of this research was to design edible biofilms on a basic matrix of sodium alginate (Al) and other hydrocolloids in which different proportions of onion extract (OE), yeast extract (YE) and *Bacillus subtilis* (*B. subtilis*) was introduced. These biofilms were evaluated from microbiological and antioxidant perspective.

The EC₅₀ (mg sample/ml DPPH solution 6×10^{-5} mol/L) value was calculated, representing the active compound concentration which inactivates 50% of the total radicals DPPH. For the YE the EC₅₀ value resulted 0.88 mg/ml and for the OE resulted with 30% smaller (0.60 mg/ml). The microbiological study targeted the influence of the OE and YE on cell viability of *B. subtilis* used as inoculum. A standardized inoculum of *B. subtilis* with a concentration of more than 10^{11} spores/g was used and a base culture of Luria Bertani Agar, Miller. After 48 hours of thermostating at 37° C the number of CFU/g resulted over 10^{10} in all experimental variations. A quantitative evaluation was made through indirect culture methods for a period of 8 days time in which the samples were preserved in refrigerated conditions at 4° C. After analyzing the data we observed a constant behavior of the probiotic bacteria *B. subtilis* through all the conservation period. The *B. subtilis* + OE sample presented a reduction of CFU/g with one unit after 24 hours until the value of 9.85×10^7 CFU/g was reached most probably due to the OE which has an antimicrobial effect. The best behavior over the preservation period was observed in case of *B. subtilis* + YE (4.51×10^8 CFU/g) sample as we consider due to the YE which offers a good source of nitrogen and vitamin content that is necessary to maintain the viability of *B. subtilis* cells. Similar values have been obtained for *B. subtilis* + OE + YE (3.57×10^8 CFU/g) with both extracts included onion and yeast that manifest a prebiotic effect for the bacterial cells.

This study showed that obtaining Al based films and incorporating distinct active ingredients with unique properties provide a „clean” solution and a future reference to healthy packaging materials. An edible biofilm which contains a mixture of YE, OE and a number of more than 10^8 CFU/g probiotic bacteria even after 8 days in refrigerated conditions can be considered as an efficient solution of bio conservation and more than that could manifest a nutraceutical effect for consumer’s immune system stimulation.

Key words: edible biofilm, *Bacillus subtilis*, yeast extract, onion extract, antioxidant activity.