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Title: Investigation of the combined effect of *Lactiplantibacillus plantarum* derived postbiotics and hydrophobic carbon dots on inhibiting *Salmonella* Typhimurium growth in refrigerated chicken breast meat

Abstract

Control of spoilage microorganisms and pathogens in meat and meat products is a challenge for food manufacturers that can potentially be overcome through the combined use of biopreservatives. Postbiotics are promising natural biotic compounds for use in the food industry due to their preservative and antimicrobial effects. Postbiotics are a new category of health-promoting molecules that are derived from probiotics during growth in the culture medium or food and cause a wide range of biological activities, including antibacterial, and antioxidant properties, etc. Carbon dots are a member of carbon nanomaterials with excellent properties such as optical, electrical, and antimicrobial properties. In this research, a postbiotic was prepared from *Lactiplantibacillus plantarum* and hydrophobic carbon dots from beeswax and their antimicrobial properties alone and in combination against *salmonella* Typhimurium in laboratory conditions and chicken meat were investigated. The results showed that the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) values of postbiotic and carbon dots against *Salmonella* Typhimurium were 25 mg/mL and 0.02 mg/mL, respectively. The fractional inhibitor concentration (FIC) index of the compounds was 1 indicating additive effect. By increasing the concentrations of postbiotic and hydrophobic carbon dots, the growth inhibition halo diameter against *Salmonella* typhimurium increased and the greatest antimicrobial effect was found in the combined solution of carbon dots MIC₅ + postbiotic MIC₁₀. In the next step, postbiotic and carbon dots alone and in combination were investigated to inhibit the growth of *Salmonella* typhimurium in chicken breast meat stored at refrigerator temperature for 16 days. The combined solution was able to reduce about 2.61 logarithmic cycles of *Salmonella* typhimurium population compared to the control group. According to the results of antimicrobial evaluations in vitro and chicken meat, the combination of postbiotics and carbon dots can be used as a suitable additive to control of *Salmonella* Typhimurium in chicken meat.

Keywords: Postbiotics, *Salmonella* Typhimurium, Chicken meat, *Lactiplantibacillus plantarum*, Hydrophobic carbon dots