Antimicrobial activity of edible film based on whey protein isolate incorporated with Zataria multiflora Boiss. essential oil against pathogenic bacteria

Mohiroosadat Shakeri M¹, Fakhri Shahidi², Shahram Beiraghi-Toosi³, Ahmadreza Bahrami A⁴
1- Ph.D. student, Department of Food Science and Technology, Faculty of Agriculture, Ferdowsi University, Mashhad.

E-mail: mo_sh26@stu-mail.um.ac.ir, 2- Scientific Board of Food Science and Technology Department, Faculty of Agriculture, Ferdowsi University, Mashhad, 3- Scientific Board of Food Processing Department, Food Science and Technology Research Institute, ACECR, Mashhad, 4- Scientific Board of Cellular and Molecular Research Group, Institute of Biotechnology, Ferdowsi University, Mashhad.

The use of biodegradable food packaging containing natural antimicrobial agents has been interested because this packaging in addition to decrease of environmental pollution, due to minimizing processes that sanitize a food product, maintain nutritional values and increase quality. In this study antimicrobial effect of whey protein isolate (WPI) films containing Zataria multiflora Boiss. essential oil were tested against E. coli (NCTC12900), Salmonella enteritidis (RTCC1621), Staphylococcus aureus (ATCC25923) and Bacillus cereus (isolated from food). WPI were produced with addition of 1, 2, 3 and 4% of Zataria multiflora Boiss. essential oil. For determination of the antimicrobial effects of films against test bacteria, circular discs (diameter = 9mm) were cut from the WPI films. One disc was placed on the plate containing 10 mL of BHI agar that inoculated by 100 μL of bacterial cultures (colony count 10⁸ CFU/mL). After 24h incubation at 37°C, the diameter of the zone of inhibition (mm) was measured and statistically analyzed. WPI film containing all concentrations of Zataria multiflora Boiss. essential oil had antimicrobial effect against S. enteritidis and E. coli but the zone of inhibition was not observed at 1% level against S. aureus and B. cereus. Also WPI films containing 3 and 4% of this essential oil had the greatest inhibitory effect (P<0.05) against all tested microorganisms. Whereas diameter differences between 3 and 4% of Zataria multiflora Boiss. essential oil was not significant, it is concluded that the use of 3% of Zataria multiflora Boiss. essential oil as a natural preservative in antimicrobial WPI film can be adequate for food packaging.

Keywords: Edible film, Whey protein isolate, Zataria multiflora Boiss., Essential oil, Pathogenic bacteria