



Abstract

In this study oil in water nanoemulsions of kalonji essential oil were formulated using whey protein isolate and tween 80 as emulsifiers by ultrasonication technique. Reaction parameters such as concentration of oil, concentration of surfactant, carrier oils and ultrasonication time were optimized. 10 % of oil concentration, 4 % whey protein with sunflower oil as ripening inhibitor when sonicated for 15 minutes gave stable nanoemulsions with particle size less than 200 nm and PDI less than 0.1. Natural emulsifier whey protein isolate gave nanoemulsions with average particle size of 50.1 ± 0.025 nm with PDI of 0.071 ± 0.003 while synthetic surfactant Tween 80 gave average particle size 109.9 ± 0.055 nm with PDI of 0.073 ± 0.004 . Prepared nanoemulsions were stable at 4°C for over a month but coalescence was observed at room temperature. Controlled release of nanoemulsions at gastric as well as neutral pH was checked. At pH 3.7, maximum release of whey protein nanoemulsions was observed after 8 hours while tween 80 nanoemulsions gave maximum release after 10 hours. At pH 7, 80% release of whey protein nanoemulsions was detected after 8 hours while 78% of Tween 80 nanoemulsions was released after 12 hours and after that no change was observed. Antimicrobial activity of prepared nanoemulsions revealed that encapsulating the kalonji oil in nanoemulsion formation did not decreased its efficiency. Prepared nanoemulsions were effective against *S. aureus*, *E. coli* and *B. subtilis*. This shows the efficacy of kalonji oil nanoemulsions as alternative to antibiotics.