ABSTRACT

Due to potential application of oregano essential oil, oregano essential oil loaded oil-in-water nanoemulsion (OEO-NE) was prepared using natural emulsifier; whey protein isolate (WPI) employing ultrasonication technique. Formulation containing 3% WPI and 10% lipid phase (5:5; OEO: sunflower oil) when ultra-sonicated for 30 minutes (with work and rest time of 15minutes each), gave stable OEO-NE having particle size and PDI of 176±0.163nm and 0.05±0.007, respectively and showed turbidity and pH of 1.526±0.08 and 6.95±0.05, respectively. Stability of OEO-NE at different temperatures and pH was also evaluated and results indicated that it was most stable at 30°C and at all pH except pH 5 (isoelectric point of WPI). Prepared OEO-NE showed storage stability of 2 weeks at 4°C, but started coagulating at 5th day when stored at room temperature. FTIR spectroscopy and SEM showed successful encapsulation of oil. Controlled release of oil from OEO-NE was also efficient in different pH such as maximum oil release of 82% and 86.7% was observed at 9th and 8th hour, respectively at gastric and neutral pH, respectively. Antimicrobial activity of free and encapsulated oil was almost same against *E. coli* and *B. subtilis*, indicating that encapsulation didn't affect the antimicrobial activity of oil. In order to evaluate the activity of OEO-NE as a natural growth promoter, a field trail consisting of 36 chicks divided into 6 groups; basal diet (negative control), basal diet+ antibiotic (positive control) and basal diet+ OEO-NE (tetraplicate experimental groups) was conducted for 1 month. The results indicated that at the end of trail, chicks of experimental groups showed body weight of 1489±14.6g which is quite greater than the body weight of chicks of positive control; 887±13.7g. Serum biochemical analysis showed no lethal effect of OEO-NE on chick's kidneys and liver. OEO-NE also enhanced lactic acid bacteria and decreased pathogenic *E. coli* population in chick's gut and positively affected the gut morphology by increasing villus height and depth and crypt depth. Thus, dietary supplementation of OEO-NE could be used as an effective and natural alternative to antibiotics in poultry industry.