



**Abstract**

In this study, clove, mint and clove-mint oil-in-water nanoemulsions were prepared by ultrasonication using whey protein and tween 80 as emulsifiers. Protein stabilized nanoemulsions showed better average particle size between 25 and 172 nm with 2.5 % (w/v) whey protein. The reaction parameters such as amplitude, energy and ultrasonic time were optimized. The stability of nanoemulsions at different pH (2-8) and temperature (30-80° C) was also tested. Whey protein stabilized nanoemulsions showed droplet aggregation (580 nm) near the isoelectric point at pH 5 and temperature above 70° C. The minimum inhibitory concentration values of clove 0.14 % (v/v) and mint oil 0.3 % (v/v) nanoemulsion was determined against *S.aureus* and *E. coli* respectively. A total of 45 chicks were divided into 9 groups in which one group was control supplemented with antibiotic while other groups were fed with clove, mint and clove-mint oil loaded nanoemulsions with whey protein and tween 80 for 42 days. After trial the body weight of clove-mint oil nanoemulsions was 1666±42.5 g as compared to control 1550±32.5 g. The cholesterol level of clove-mint oil nanoemulsions group was 129 ± 2.08 mg/dL compared to control 93±1.39 mg/dL. It was concluded that group using clove-mint oil nanoemulsion showed better growth performance, increased antibody titer against Newcastle disease virus, reduced cholesterol level and longer duodenum villi as compared to control. Thus, the antimicrobial property of essential oil makes them as efficient alternative to antibiotic.