

Abstract

In this study, lemongrass essential oil nanoemulsions were formulated using emulsifiers such as whey protein isolate by employing the technique of ultrasonication. Reaction parameters such as type of emulsifiers (sodium alginate, whey protein, pectin, guar gum, sodium casienate+ pectin, sodium casienate+ lecithin), whey protein concentration (2, 3, 4, 5, 6, 7, 8, 9%), oil concentration (5, 10, 15, 20, 25, 30, 35, 40, 45, 60%), type of carrier oils (canola, sunflower, corn, soy bean) ratio of essential oil to carrier oil (0.5:1, 1:1, 1.5:1, 2:1) and sonication time (10, 15, 20, 25, 30, 35, 40 minutes) were optimized. Stable lemongrass oil nanoemulsion was prepared with 5% whey protein, 10% lemongrass oil in 1:1 ratio of lemongrass oil and sunflower oil with 30 minutes (30s off cycle) of sonication time. The particle size obtained was 54nm that was <200nm and the PDI value 0.069 that was < 0.1. These prepared nanoemulsion exhibited anti-bacterial activity against *Staphylococcus aureus* and *Escherichia coli*. As the bacterial growth was inhibited to zero indicating strong antibacterial action. Likewise, zone of inhibition (mm) against these strains were 16mm and 12mm respectively. Effective encapsulation of lemongrass oil was validated by using UV spectroscopy and FTIR analysis. Hence, these nanoemulsions can be used as alternatives to chemical preservatives to combat microbial spoilage. Subsequently, biocomposite film used for food packaging was prepared by using the blend of 5% of wheat starch, 20% CMC (w/w wheat starch), 30% of glycerol and 15% of optimized lemongrass oil nanoemulsion. These films exhibited considerable antibacterial activity against *S. aureus* and *E. coli*, gave zones of 15mm and 12mm. Therefore, these biofilms can be potentially employed as a substitute of synthetic plastic packaging and for extending the shelf life of food. Thus, they can be denoted as bioactive edible food packaging material.