

Abstract

In this study, natural polymeric biofilms were prepared and loaded with cinnamon essential oil (CEO) nanoemulsions as antibacterial agents for use in food packaging. Oil-in-water nanoemulsions of CEO were prepared using whey protein isolate (WPI) as a natural emulsifier by ultrasonication technique. The nanoemulsions were optimized on the basis of different reaction parameters. 4% WPI, with CEO to soybean oil ratio of 1:1 and an ultrasonication time of 30 minutes, gave nanoemulsions with a droplet diameter of 72.1 nm and a polydispersity index of 0.069 which were <200 nm and <0.1 respectively. This was followed by the preparation of films by solution casting technique using wheat starch, carboxy methyl cellulose (CMC) and a blend of both, respectively. The CEO nanoemulsion and glycerol (plasticizer) were then added. These films were optimized for their properties on the basis of polysaccharide concentration, glycerol content and concentration of CEO nanoemulsion. The film optimized for use as food packaging were obtained using a blend of 5% wheat starch and 20% CMC (w/w wheat starch), containing 30% glycerol and 15% CEO nanoemulsion. This had a thickness of 0.125 mm, UV transmittance of 31%, water solubility of 18.98%, moisture content value of 10.12% and considerable antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*, respectively. The optimized film containing CEO nanoemulsion, film without CEO nanoemulsion and poly vinyl chloride wrap, were used for wrapping pieces of raw chicken meat which were stored at 4 °C for 15 days after which their quality attributes were determined. The chicken wrapped in the optimized blend films showed the lowest change in pH up till day 7 (5.71 to 6.98), lower weight loss percentage than PVC, and the lowest total bacterial count after 15 days. Therefore, polymeric biofilms based on a blend of wheat starch and CMC, when incorporated with CEO encapsulated in nanoemulsions have the potential to be used as bioactive edible food packaging materials in place of synthetic plastic packaging.