

## ABSTRACT

Microbial contamination of food mostly causes food insecurity and economic loss; appropriate packaging is necessary to stop contamination and deterioration. While, plastic packaging is commonly used, it poses hazardous to health and environmental risks and is rarely recyclable. In food packaging, biomaterials are becoming popular because of their biodegradability, renewable nature, and low environmental effect. Hence, the current study aimed to synthesize zinc oxide chitosan based nanocomposite (ZnOCh-NCs) as biodegradable food packaging material using a solution casting method. Four composite films with varying concentration of ZnOCh nanoparticles (1%, 2% and 3% wt) were prepared, showing superior properties compared to conventional films. For characterization, fourier transform infrared spectroscopy (FTIR) and ultraviolet-visible (UV-VIS) spectrophotometry were used. UV spectroscopy revealed that the ZnOCh-NCs were absorbing light at a wavelength corresponding to 370 nm, which was the strongest peak at that wavelength. Peaks 3275, 2877, 1640, and 1543  $\text{cm}^{-1}$  in the FTIR data were indicative of the presence of functional groups, such as -OH, -NH<sub>2</sub>, and C=O. Bacterial strains were identified by morphological, biochemical, and differential media growth methods after being isolated from spoiled chicken. According to the 16S rRNA sequencing analysis, which confirmed that the strain SHA belong to *Klebsiella pneumonia* and SHC belong to *Serratia marcescens*. According to a biofilm time kinetics research all five strains exhibited mature biofilm development on the fifth day of incubation at 37°C using the crystal violet test tube method. ZnOCh films antibacterial activity was evaluated using the agar well diffusion assay on bacterial strains that are often seen in packed meat. According to the one-way ANOVA test, ZnOCh 3% exhibited considerably ( $p < 0.05$ ) bigger zones of inhibition (ZOI) ranging from 1.3 to 1.9 mm when compared to the positive control, erythromycin (20  $\mu\text{g}/\text{mL}$ ). Conversely, no ZOI was found when compared to the negative control (water). In 14 days, biodegradability of the nanocomposite films ranged from 70% to 80%. The Ch film loaded with ZnOCh 1% had faster degradation rate as compare to ZnOCh 2% and 3 %. The produced film poses no danger to the environment, has significant potential for application in the environmental friendly food packaging industry. In conclusion, this research underscores the impressive antibacterial potential of ZnOCh NCs and highlights their biodegradability.