

ABSTRACT

Aquaculture industry is rapidly expanding field, playing an important role in providing protein base food globally. However, this industry is facing a lot of challenges including bacterial pathogens and their antibiotic resistance, because bacterial pathogens and their associated diseases are the potential limiting factor to the productivity of this industry. Therefore, there is a need to address such challenges through innovative strategies. This current study aimed to evaluate the in-vitro antibacterial potential of *Allium cepa* conjugated silver nanoparticles (AC-AgNPs) against fish associated bacterial pathogens synthesized using biological approaches. The characterization of AC-AgNPs was done using UV (visible spectroscopy), FTIR (Fourier transform infrared spectroscopy) and SEM (Scanning electron microscopy). Different fish associated pathogenic bacteria including *Aeromonas hydrophila*, *Acinetobacter baumannii*, *Flavobacterium columnare*, *Streptococcus iniae*, *Yersinia ruckeri*, *Acinetobacter lwofii*, *Aeromonas veronii*, *Mammalicoccus sciuri* and *Enterococcus durans* were used to evaluate the antibacterial activity of AC-AgNPs at three different concentrations (1 mg/ml, 3 mg/ml, 5 mg/ml). The maximum zones of inhibition were observed at 5 mg/ml, against *Aeromonas hydrophila* (24.6 ± 0.2 mm), *Flavobacterium columnare* (23.8 ± 0.2 mm), *Acinetobacter baumannii* (22.7 ± 0.4 mm), *Streptococcus iniae* (21.5 ± 0.3 mm), *Yersinia ruckeri* (20.3 ± 0.4 mm) and *Acinetobacter lwofii* (19.9 ± 0.3 mm). The antibacterial activity was further assessed by the AC-AgNPs synthesized at different pH values (2, 7, 11) and different temperatures (4°C, 20°C, 60°C). The largest zone of inhibition was observed against *Flavobacterium columnare* (23.8 ± 0.2 mm) at pH 7. Similarly, AC-AgNPs induced the zones of inhibition at various temperature ranges where maximum zone of inhibition was observed at 20°C against *Aeromonas hydrophila* (24.6 ± 0.2 mm). Meanwhile, at 4°C the largest zone of inhibition was observed against *Yersinia ruckeri* (19.5 ± 0.3 mm), and *Acinetobacter baumannii* (18.6 ± 0.1 mm) at 60°C. This evaluation demonstrates the stability of biological synthesized *Allium cepa* conjugated silver nanoparticles (AC-AgNPs) at different temperatures ranges (4°C, to 60°C) and pH values (2, 7, 11). Moreover, these findings suggest that *Allium cepa* conjugated silver nanoparticles (AC-AgNPs) possess a significant antibacterial potential against many Gram-positive and Gram-negative bacteria that can be used as an alternative strategy for controlling fish diseases in aquaculture industry.

Keywords. Silver nanoparticles, Antibacterial activity, *Allium cepa* extract, Fish pathogens.