

ACUTE TOXICITY OF SILVER NANOPARTICLES SYNTHESIZED FROM CISSUS QUADRANGULARIS IN POECILIA RETICULATA LARVAE AND ITS ANTIBIOFILM ACTIVITY AGAINST GRAM POSITIVE & GRAM NEGATIVE BACTERIA

Shanthi Sathappan¹, Vaseeharan Baskaralingam^{2*}

¹ Institute of Animal Science, Poultry and Aquaculture Sci. Dept., Agricultural Research Organization, The Volcani Center, P.O.Box 6, Bet Dagan 50250, Israel.

² Department of Animal and Health and Management, Alagappa University, Science Block 4th Floor, Karaikudi-630004, Tamil Nadu, India.

*Corresponding author: Vaseeharanb@gmail.com

The biosynthesized silver nanoparticles using *Cissus quadrangularis* (CQ-AgNPs) showed excellent antibacterial activity against gram-positive (*Bacillus licheniformis*, *Bacillus pumilus*), and gram-negative bacteria (*Pseudomonas aeruginosa*, *Vibrio parahaemolyticus*). The maximum zone of inhibition was higher in *Pseudomonas aeruginosa* (3 mm, 4 mm, 5 mm, and 6 mm, respectively) than other bacteria. The light and CLSM microscopic images showed strong adhering ability of gram-positive and gram-negative bacteria which led to the development of dense biofilm formation on the glass pieces. Moreover, treatment with CQ-AgNPs also affected the thickness (μm) of the biovolume (μm^3) and the average thickness (μm) was reduced in the biofilms formed by both bacteria's, as evidenced through COMSTAT analysis. The toxicity studies in *Poecilia reticulata* larvae showed 100% mortality in AgNO_3 (1 $\mu\text{g}/\text{ml}$); 40% in CQ-AgNPs (20 $\mu\text{g}/\text{ml}$) whereas no mortality was observed for the CQ extract up to 500 $\mu\text{g}/\text{ml}$. Histopathological observation showed that the abnormal tissue texture in CQ-AgNPs treated *Poecilia reticulata* larvae. Further, the CQ-AgNPs treated *Poecilia reticulata* larvae cells showed DNA damage at the concentration of 20 $\mu\text{g}/\text{ml}$ in the 0.6% agarose gel when compare to the control. The protein released from the CQ-AgNPs treated *Poecilia reticulata* larvae cells were disrupted quickly with sodium dodecyl sulphate (SDS) than the non-treated cells and shown the protein profile ranging from 118 KDa to 135 KDa. Hence, the current findings suggest that CQ-AgNPs would appear to have a less toxic effect than AgNO_3 on aquatic organisms in freshwater environments especially in *Poecilia reticulata*; thus more attention should be paid to preventing their accidental or intentional release into aquatic ecosystems.

Keywords: Acute toxicity, AgNPs, *Poecilia reticulata*, Biofilm, *Cissus quadrangularis*

*Corresponding author: Vaseeharanb@gmail.com