**Determination of Antimicrobial Activity of Ag NP and Ag@GO Nanocomposite Biosynthesized by Clove Extract**

Fatih Doğan KOCA1, İsmail ÜLGER2, Dilek DEMİREZEN YILMAZ3, Nurhan ERTAŞ ONMAZ4,Mahmut KALİBER2, Erdal YILMAZ2

1 Erciyes University, Faculty of Veterinary Medicine, Dpt. of Aquatic Animal and Diseases, Kayseri, Turkey

2 Erciyes University, Faculty of Agriculture, Dpt of Animal Science, Kayseri, Turkey

3 Erciyes University, Faculty of Sciences, Dpt. of Biology, Kayseri, Turkey

4Erciyes University, Faculty of Veterinary Medicine, Dpt. of Food Hygiene and Technology, Kayseri, Turkey

Nanoparticles (NPs), small than 100 nm, can be synthesized by chemical, physical, and biological methods. The biological methods include synthesis of NPs from the extracts of such as plant, fungi, algae etc. Graphene oxide (GO), an anolog of graphene, have rich functional groups such as hydroxyl, carbonyl and epoxy groups. These groups play a key role for interact with NPs and GO sheets. Also, abundance of these groups on the surface of GO facilitates its dispersibility in polar solvents, such as water. Because of hydrophilic property has wide application on the ındustry. In this study, we compared of antimicrobial activities bio-synthesized silver nanoparticle (Ag NP) and Ag@GO hybrit nanocomposite. Briefly, NaCl solution (0.09 M) was added dropwise to the mixture of 0.1 mg / mL GO, 5 mM Ag NP and 2 mL clove extract. The solution stirred about 10 seconds and NaCl solution (0.29 M) was added. After30 minutes stirred, the mixture was centrifuged at 3000 rpm for 5 min, solid Ag@GO composites were dispersed in 5 mL of deionized water, centrifuged and the was dried for characterization studies. Gram positive (*Staphylococcus aureus*, *Listeria sp*.,) and negative (*Escherichia coli*, *Salmonella sp*.) bacteria were used to detected antimicrobial activities of Ag NP and Ag@GO. The minimum inhibitor concentration (MIC) were determined by broth microdilution technique. The Uv-vis. peaks of plant extract, Ag NP and Ag@GO were measured at 272 nm; 321 and 453; 268; 363 nm respectively. Ag NPs are deposited on GO nanosheets successfully and the average size of Ag NPs is about 75-80 nm. According to DLS average effective diameters of Ag NP (pH 4.46) 150 nm. Zeta potantial of GO was -16.6 mV, Ag@GO was -26.3 mV. According to these characterization results, Ag NPs were successfully deposited on the surface of GO and Ag NPs made Ag@GO nanocomposite highly negatively charged. Ag@GO nanocomposites have more effective antimicrobial activity than bare Ag NP and plant extracts against *Salmonella sp*., *Listeria sp*., *S. aureus* and *E. coli*. The main mechanism of antimicrobial activity of Ag@GO can be explained by direct interaction with the microorganism, accumulation on membrane/cell, production of reactive oxygen species (ROS) and cell death induction. As a result, we synthesized of Ag@GO nanocomposite by green nano-biotechnology and the nanocomposite exhibited quite promising antimicrobial activity against Gram positive and negative bacteria.

**Keywords**: Bio-Synthesis, Silver@Graphene Oxide Nanocomposites, Antimicrobial Activity.