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Green Synthesis of Silver Nanoparticles Using Aqueous Extract of *Typha domingensis* Pers. Pollen (qurraid) and Evaluate its Antibacterial Activity

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Abstract:

In this study, the aqueous extract of (*Typha domingensis* Pers.) pollen grain (qurraid) to know its ability to manufacture silver nanoparticles. Qurraid is a semi-solid yellow food substance, sold in Basra markets and eaten by the local population. It is made from the pollen of the *T. domingensis* Pers. plant after being pressed and treated with water vapor. The Gas chromatography–mass spectrometry (GC-MS) reaction was done to identify the active compounds of qurraid aqueous extract. The ability of the aqueous extract of qurraid to manufacture silver nanoparticles was tested, and the construction of silver nanoparticles was inferred by the reaction mixture's color, which ranged from yellow to dark brown. The synthesized silver nanoparticles (AgNPs) were described by UV-Vis, FTIR, XRD, SEM, and EDX. Then its anti-bacterial activity was estimated by the agar well diffusion method. The findings of the GC-MS analysis of the qurraid aqueous extract showed the major components with their ratio were: 5-Hydroxymethylfurfural with RT% 13.6196, 3-Deoxy-d-mannoic lactone 6.4285,. alpha.-L-lyxo-Hexopyranoside, methyl 3-amino-2,3,6-trideoxy- 4.264, 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- 3.2078, and 1,3-Methylene-d-arabitol 3.1257. The construction of silver nanoparticles was described by spectroscopic methods, where the highest peak was recorded at 400nm by UV-Vis spectrum, which indicates the silver spectrum. The mineral nature of AgNPs was confirmed by XRD analysis, in which the highest peaks were, 111, 300, and 330 were recorded. In addition, the qrdAgNPs nanoparticles were spherical with sizes ranging from 20-70nm. The results of the EDX confirmed that the chemical composition of AgNPs was silver. The ability of the AgNPs was tested against four bacterial species, three of which were Gram-negative *Escherichia coli* A1, *Escherichia coli* A2, *Alcaligenes faecalis* AL1, and the fourth was Gram-positive bacteria *Bacillus zanthoxyli* B1 , which were identified by traditional and molecular methods using 16SrRNA gene sequencing, antibacterial activity results of AgNPs showed that it increases with increasing of AgNPs concentration, and the most sensitive species to silver particles was *Alcaligenes faecalis* AL1bacteria.

Keywords: Antibacterial activity, Biogenic synthesis, AgNPs, aqueous extract, *Typha domingensis*.

Introduction:

Taniguchi Norio was the first to coin the term nanotechnology in 1974, which means nanomaterials with dimensions 1-100 nanometers. Nanoscience includes many branches of knowledge and has many applications in the medical and pharmaceutical fields[1]. Due to the unique characteristics and the good inhibitory effect of silver nanoparticles to inhibit pathogenic bacteria, researchers tend to use nanoparticles, especially silver nanoparticles, as alternatives to the antibiotics currently used in the treatment of diseases resulting from infection with antibiotics resistant bacteria, because of the increase of bacterial resistance to available antibiotics[2]. In the past, silver was used to prevent or inhibit human pathogenic microorganisms, due to its ability to fight these organisms. Silver nanoparticles have many applications in the medical field, where silver in its various forms was used in treating burns or skin infections and as dressings. In industrial application, it was used in many household appliances such as refrigerators and other industrial applications[3]. Because of the increase in bacterial resistance to