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THE EFFECT OF SOME NANOPARTICLES ON *RHODOTORULA* SP.

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ABSTRACT: Numerous nanoparticles have the ability to inhibit the growth of bacteria, fungi, and viruses. such as Nanoparticles of gold and silver. It affects these microbes' cell membranes, which results in cell death .**Aim of study** the study aimed to find the difference between the influence of silver nanoparticles and gold nanoparticles on inhibit growth of the isolated *Rhodotorula* yeast , After we isolated *Rhodotorula* yeast from affected patients and its microscopic and phenotypic diagnosis. We investigated the differences between effect of the two types of nanoparticles used by measuring the inhibition zone for fungal growth using the drilling method at three different concentrations: 1%, 2%, and 4% of silver and gold nanoparticles. It was discovered that the inhibitory effect on fungal growth increased with the concentration of these components. After comparing the two types' effects, we discovered that the effect of silver (Ag-Nps) concentrations was more effective than that of gold nanoparticles (Au-NPs) at inhibition *Rhodotorula* from growing.

KEYWORDS: Nanoparticles, Silver nanoparticles, gold nanoparticles, *Rhodotorula* sp.

INTRODUCTION :

A group of materials known as nanoparticles has characteristics that set them apart from their bulk and molecule counterparts (Biswas, P., & Wu, C. Y. 2005) . The use of particle delivery systems as carriers for both small and big molecules in medicine delivery has garnered significant research interest during the last few decades (Mohanraj& Chen2006). the creation of nanoparticles is traced back to Paul Ehrlich, followed by Ursula Scheffel and colleagues' initial attempts and the substantial work done by Professor Peter Speiser's group at the ETH Zürich in the late 1960s and early 1970s (Kreuter, J. 2007). Nanoparticles have been employed in medicine as a growth inhibitor or as a means of eradicating pathogenic microbes. Compared to non-synthesized and free drug equivalents, systemic (i.e., intravenous) drug delivery systems based on nanoparticles or microparticles provide a number of advantages. Treatments can be administered, for instance, to parts of the body that traditional delivery methods are unable to

reach using nanoparticle systems. Therefore, one of the systems that is being researched the most in preclinical and clinical settings is nanoparticle drug delivery and imaging systems (Anselmo, A. C., & Mitragotri, S. 2016 , Jasim, N. O., & Mohammed, K. I. 2022) Under an electron microscope, its effects of some nanopacticles as Ag-nanoparticles were also examined, and it was discovered that, for the pathogenic fungi identified clinically, there was a definite suppression of the sporangia as well as a change in their morphology(Mohammed, K. I., & Jasim 2022)..also the external functionalization of gold nanoparticles (GNPs) is required for biomedical applications in order to direct them towards certain disease sites and enable them to selectively interact with cells or biomolecules. (Daraee, H.,et al ,2016).

Rhodotorula species are ubiquitous saprophytic yeasts that can be recovered from many environmental sources, including sites with unfavorable conditions .*Rhodotorula* species ,Once thought to be nonpathogenic, it is now recognized as opportunistic infections that can colonize and infect patients who are vulnerable The majority of human cases of *Rhodotorula* infection were fungemia related to central venous catheter (CVC) use, according to the few references to the pathogenicity of *Rhodotorula* spp. in animals. (Wirth, F., & Goldani, L. Z. 2012) The efficacy of nanoparticles against it has been demonstrated. The response of *Rhodotorula mucilaginosa* cells to the concentration of nanoparticle dose was hierarchical. Due to the capsaicin's nanoporous characteristics in BSA particles, the nanoparticles responded differently to the uptake process.(Sánchez-Arreguin et al 2019)

MATERIALS AND METHODS:

1- Material:

Silver nanoparticles\ gold nanoparticles ,

2-Isolation of *Rhodotorula* yeast

In this study, the nails of patients infected with skin fungi served as samples. After carefully collecting and culturing the samples, they were brought to the laboratory for examination and incubation.

3- Preparation of concentrations for nanoparticles

Using sterile distilled water at 50 °C, different quantities of gold and silver nanoparticles were independently created. One, two, and four milligrams of silver nanoparticles were dissolved in one hundred milliliters of distilled water to get the concentrations (1%, 2%, and 4%), respectively. Gold nanoparticles work similarly.

4- A method of measuring the effect of nanoparticles on yeast growth: Benson, H. J. (2002).

after isolating the yeasts to be tested ,anew yeast agar medium was prepared and the isolate was transferred to it using the planning method , Using a cork drill, holes with a diameter of 5 mm were made in each Petri dish

Next, 0.25 ml of each concentration of the prepared nanomaterial solution was transferred separately and placed in each hole. Each dish's diameter of inhibition was measured during an incubation period at 37 degrees Celsius, and the procedure was repeated three times for each concentration. We monitor the growth and measure the diameter of inhibition for each concentration

RESULT & DISCUSSION:

First, pathogenic fungi were isolated from infected patients and diagnosed phenotypically to conduct experiments on them (Fig1) (Hibbett DS et al. 2007; Sciortino ,2017)

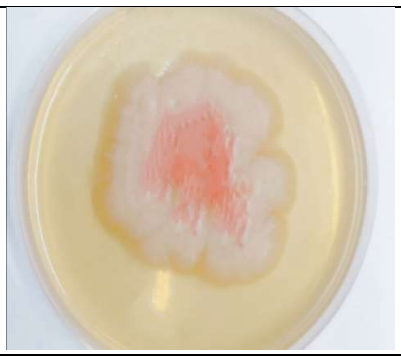

Fig (1) *Rhodotorula* spp

The following table (table 1), which was created after the pathogenic microorganism was treated with silver nanoparticles, illustrates the significant variations between the various concentrations and the degree of their impact on the pathogen. The inhibition zone was observed to be 18.50 mm at the 1% concentration and to grow with the concentration, reaching 31.50 mm at the 4% concentration. The larger the concentration, the larger the zone of inhibition, or the percentage of effect, Due to the direct effects of these compounds on the microscopic organism's cellular membrane, which result in cell death and breakdown as well as structural alterations within the cells.(Nasrollahi &Mansourkiaee ,2011; Sandhu & Shukla 2017. This aligns with the findings of Jasim, N. O., & Mohammed 2022 they are study on the impact of silver nanoparticles on Rhizopus arrhizus. It also concurs with a set of findings made by Russell & Hugo 1994; Klasen 2000 during testing on several bacterial species, wherein they discovered that it similarly had a growth-inhibiting impact. Mohammed, K. I., & Jasim, N. O. also discovered that after treating the fungus *Rhizopus arrhizus* and looking at it under an electron microscope, there were morphological alterations and spore dissolution in the fungal cells.

Table (1) Effect of silver nanoparticles on the growth of *Rhodotorula* yeast

Concentration	Inhibition zone diameter
1%	18.50±0.86 A
2%	22.50±1.44 A
4%	31.50±3.4B
LSD(P<0.05)	5.59

Different letters denote the significant difference at p< 0.05 (Mean ± Standard error)

Table (2) Effect of gold nanoparticles on the growth of *Rhodotorula* yeast

Concentration	Inhibition zone diameter
1%	13.33±0.44 A
2%	18.83±0.60 B
4%	23.66±1.16 C
LSD(P<0.05)	2.76

Different letters denote the significant difference at p< 0.05

Table No.2 shows the effect of gold nanoparticles on the yeast isolated in our research, Here it was observed that the inhibition zone was 13.33mm at 1% concentration and increased with concentration to reach 23.66 mm at 4% concentration. The higher the concentration, the greater the area of inhibition. Charge and hydrophobicity have been demonstrated by Elci, et al 2016.to play a role in cellular uptake of functionalized AuNPs. They demonstrated that a significant factor in these particles' hazardous efficacy is their surface charge.(Kim, et al 2010)

Table (3) Comparison between the two effects

Concentration	Inhibition zone diameter Silver nanoparticles) (	Inhibition zone diameter Gold nanoparticles)(
1%	13.33±0.44Aa	18.50±0.86 A
2%	18.83±0.60 B	22.50±1.44 A
4%	23.66±1.16 C	31.50±3.4B
Mean	18.61±1.54a	24.16±2.21b
LSD(P<0.05)	4.08	

Means the Different capital letters in the same column and small letters in the same row are significantly different (Mean ± Standard error)

When comparing the two effects on the same pathogenic microorganism and at the same concentrations (table3), we was found that the effect of silver nanoparticles is greater than the effect of gold nanoparticles on it. Here I agree with Amin et al 2009 when the study was also conducted on two types of bacteria and at the same concentrations for Ag-Nps and Au-NPs , in that it was found that Ag-Nps had a higher effect than Au-NPs

CONCLUSION:

Since we acquire a better inhibition of yeast by increasing the concentration of both types of nanoparticles utilized in this study. In the future, it might be a helpful defense against this genera of fungal illnesses, but we take into consideration that the impact of silver nanoparticles is larger than that of gold nanoparticles.

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