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BIOSYNTHESIS OF ZNO NANOPARTICLE IN PRESENCE OF RED ONION EXTRACT

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Abstract

Nanoparticles of ZnO were synthesized by eco-friendly method by using red onion extract which using as a reducing agent. Characterized of these particles were investigated by UV-Vis spectroscopy, scanning electron microscope (SEM) and FTIR analyze. Also activity of ZnO nano-sized studied by tested against of yeast (*Cryptococcus neoformans*) and bacteria (*Bacillus subtillis*). Results of Uv-Vis spectrum show, ZnO nanoparticles have absorption band at 370nm and SEM images were shows spherical like structure. Antimicrobial activity tests appear nano ZnO have effects on growth of microorganisms were tested.

Key words : ZnO, Biosynthesis, *C. neoformans*, *B. subtilis*, nanoparticles.

Introduction

In recent year the development of nanotechnology has led to the growing of our ability to deal with engineering material and nano scale material and manufactured it (Vennila & Jesurani, 2017) Nanoparticles are characterized by different qualities of molecules when they are large size ,where possessing magnetic ,electronic and optical properties make them behave differently . Among these metal nanoparticles are promising because they have remarkable antimicrobial properties ,these due to their large surface ratio to their size (Saputra & Yulizar, 2017). From nanoparticles that have become famous among researchers, ZnO nanoparticles due to its various applications (Swati, *et al.*, 2015) Zinc oxide is an interesting metal oxide because it can exist In different forms,it can be synthesis by different methods .These methods may be chemical such as sol-gel technique and other ways ,biological methods which using biological agents such as plant extracts are a promising alternative to conventional method of chemical synthesis (Swati, *et al.*, 2015; Phindile, 2012) Many research has shown that, plant extracts, can produce nanoparticles through biological pathways (Lizabeth & Marym, 2015; Awwad, *et al*., 2013). Thus the current work shows that red onion extract on the synthesis of zinc oxide nanoparticles. Only some reports green synthesis of nanoparticles zinc oxide using extracts but this is the first time to report the detection of red onion extract and characterizations techniques.

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Materials and Methods

Prepare extract:

50 grams of red onion fruits were washed twice or more well with distilled water to remove the dust particles then Finely chopped and crushed using a mortar and pestle then 100ml of double distilled water. The yellow extract was filtered through the filter paper Maman No. 1.

Fungal Strain: *Cryptococcus neoformans and bacillus subtilis* which obtain from laboratory of microbiology of Science College /university of AL-Qadisiyah.

Biosynthesis of Zinc Oxide nanoparticles:

1Mm of Zinc Acetate Zn (O, CCH*f*), was dissolved in 100 ml de-ionized water under magnetic stirring at room temperature (1200 rpm). After obtaining a solution, 1-20 ml of an aqueous solution of red onion extracts was added drop by drop in zinc acetate solution Change in white to brown. Leave the mixture under stirring for 2 minutes stirring vigorously. The suspended particles were purified by dispersing insterilized distilled water and centrifuged 4 times. Afterwards, the nanoparticles were washed with (DDW) and dried at 100°C.

Characterized of biosynthesis of Zinc Oxide nanoparticles:

i- UV-visible Spectroscopy Analysis: The formation of ZnO nanoparticles was determined using visible UV spectroscopy. Using spectrophotometer at room temperature.

ii- Scanning Electron Microscopy (SEM): By used Scanning Electron Microscopy (SEM) technique for measuring nanoparticle size and shape of nanoparticles that synthesis.

iii- FTIR spectrum analysis: FTIR spectra were measured at room temperature in the range of 4000–400 cm^{-1}. Samples were gently mixed KBr powder and compressed into discs.

Antimicrobial activity:

Antimicrobial activity of the extracts was carried out by disc diffusion method (Awwad, *et al*., 2013). Circular discs of 5 mm diameter were made from the What man No. 1 filter paper and sterilized by autoclaving at 15lb/ $inch^2$ for 15 minutes. The sterile discs were impregnated with equal volume (100µg/ml) of red onion extracts and ZnO nanoparticles The discs containing each of 25µl samples were aseptically placed on plates containing SDA medium after being spreader with each of the test pathogens, . The plates were incubated at 37ºC for 24 hours and the zone of inhibition was measured.

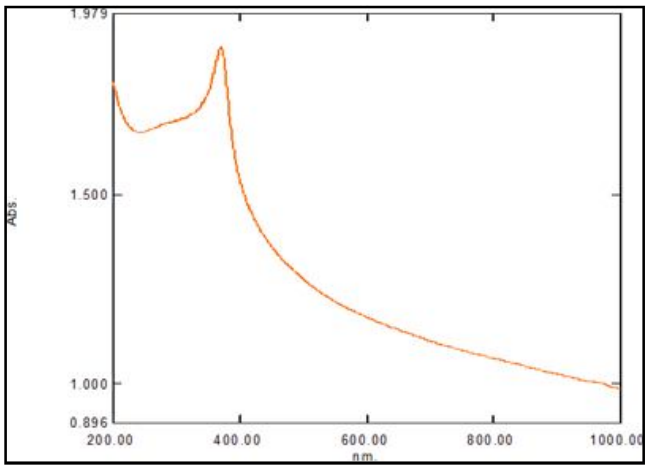

Fig. 1: UV- VIS absorption spectra of ZnO nanoparticles.

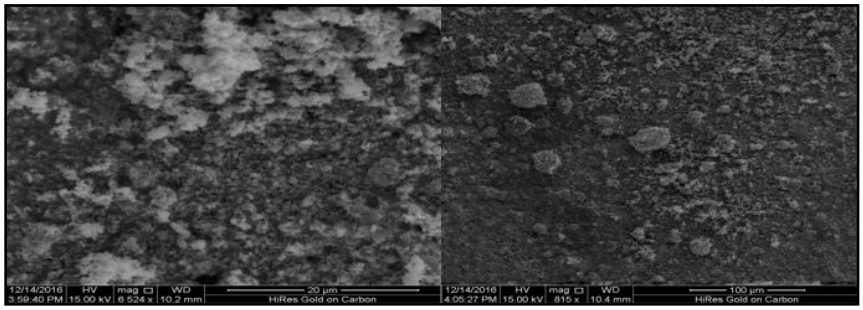

Fig. 2: SEM image of zinc oxide nanoparticles.

Results and Discussion

Synthesis of ZnO nanoparticles:

When add of red onion extracts drop by drop in zinc acetate solution Change in white to brown.

Characterized of biosynthesis of Zinc Oxide nanoparticles:

Fig. 1 appears UV-visible Spectroscopy Analysis of biosynthesis ZnO nanoparticles was found near 380 nm. This result correlates with the already reported results, in which absorption peak was found at 380 nm (Jayarambabu, 2014).

Scanning Electron Microscopy:

Biosynthesized ZnO NPs morphology was examined by SEM which appears in Fig. 2 it's appearing number of aggregates .And spherical-shaped nanoparticles. A result that coincides with previously reported results, indicating the formation of spherical nanoparticles and molecules assembled in the Calo Tropez leaf extract (Vidya, 2013)

FTIR spectrum analysis:

The FTIR spectrum of ZnO nanoparticles was recorded in the range of 500–4000 cm 1517 cm^{-1} and 432 cm^{-1} the absorption band was indicating Zn-O stretching vibration. The peak in the region between 400 and 600 cm1 is allotted to Zn–O. The peaks at 1383 cm1 and 1076 cm1 may be ascribed to –C–O and –C–O–C. This results accordant with fined by (Sadhan & Chaudhuri, 2017; Santhoshkumar, 2017; Kavitha, 2017).

Antimicrobial activity:

The antimicrobial activity of biosynthesis produced was tested on *Candida albicans and Bacillus subtilis*. The inhibition test were due to by disc diffusion method. Fig. 4 appearance growth inhibition of yeast and bacteria by ZnO nanoparticles compare with extract of red onion .this results accordant with (Yanping, 2011). The antibacterial activity of ZnO nanoparticles increases with a decrease in particle size (Nair, 2009). Although the antibacterial mechanism of nanoparticles zinc oxide is still unknown, the membrane damage potential caused by direct reaction or electrolysis between zinc oxide and cell surfaces, cellular absorption of zinc oxide nanoparticles, the production of activeoxygen species such as H_2O_2 in cells due to oxides Minerals have been suggested in previous studies (Fu, 2005; Stoimenov, 2002).

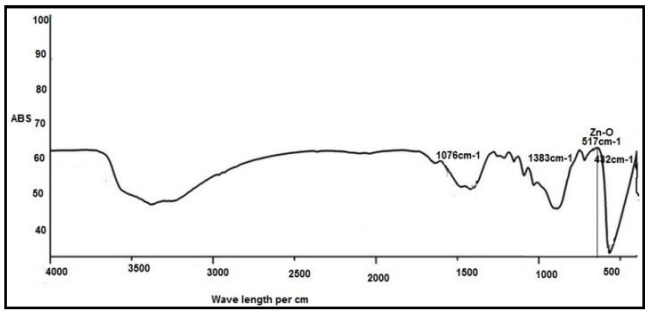

Fig. 3: FT-IR Spectrum of ZnO nanoparticles.

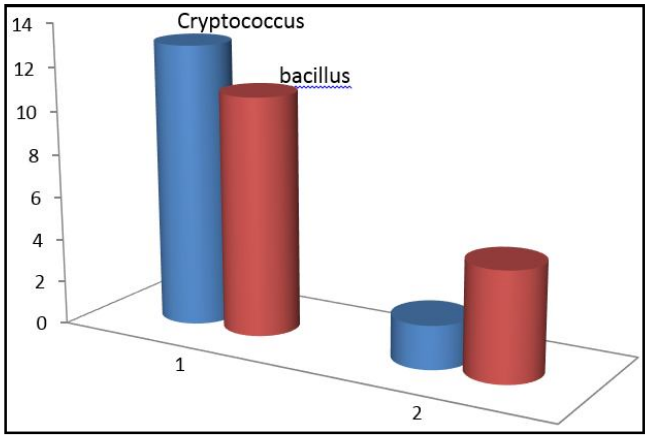

Fig. 4: Antimicrobial activity of ZnO nanoparticles against*Cryptococcus neoformans and bacillus subtilis*. 1: biosynthesis ZnO 2: red onion extract only.

Conclusion

The usage of plant extract considered clean and simpler approaches and less effected on the environment. The presence of phytochemicals in red onion extraction helps in the synthesis of nanoparticle oxide by creating oxidation and reducing reaction. Synthesis of ZnO nanoparticles were measured using the UV- Visible spectroscopy at a maximum absorbance of 380 nm. SEM images appear number of aggregates. And spherical-shaped nanoparticles to emphasis the synthesis of ZnO nanoparticles Also FTIR analysis confirmed synthesis of these particles. ZnO nanoparticles have antimicrobial activity against test *Cryptococcus neoformans and Bacillius subtilis bacteria.*

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