https://doi.org/10.33472/AFJBS.6.5.2024. 2520-2526

AfricanJournalofBiological Sciences

ANTIOXIDANT PROPERTY AND SEM CHARACTERISTICS OF ZINC OXIDENANOPARTICLES USING EXTRACTS OF PHOENIX DACTYLIFERA – AN INVITRO STUDY

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Article History
Volume 6, Issue 5, Apr 2024
Received: 01 May 2024
Accepted: 09 May 2024

doi:
10.33472/AFJBS.6.5.2024. 2520-2526

ABSTRACT :

Background:
Phoenix dactylifera is a species of flowering plant in the plant family (Arecaceae). It has developed in popularity due to its edible and delectable fruit. Northern Africa, the Middle East, and South Asia are the primary growing regions for date palm trees. It has become naturalized in numerous tropical areas around the globe. The production of Nanoparticles based on green synthesis offers numerous advantages over traditional physio-chemical approaches and has multiple health applications. Hence, zinc oxide Nanoparticles were synthesized from PhoneixDactylifera their anti-oxidant property is assessed and their characterization was evaluated using scanning electron microscopy .

Aim:

The present study focuses on the anti-oxidant mechanism or pathways adopted by zinc oxide Nanoparticles and their SEM (scanning electronic microscope) characteristics.

Materials and methods :
The existence of Nanoparticles was confirmed using images taken using scanning electron microscopy. The antioxidant activity of biogenic produced zinc oxide Nanoparticles was evaluated using the DPPH assay. Ascorbic acid was utilized as a control. The following equation was used to calculate the percentage of inhibition:

$$\% \text{ inhibition} = \frac{\text{Absorbance of control} - \text{Absorbance of test sample}}{\text{Absorbance of control}} \times 100$$

Results:
SEM portraits of zinc oxide Nanoparticles at various magnifications. Nanoparticles with nearly spherical and hexagonal shapes are plainly seen. The anti-oxidant activity of ZnO NPs was virtually comparable to that of normal vitamin C, and the activity may be increased if further functionalized or modified.

Conclusion :
As measured by DPPH activity, the antioxidant activity of zinc oxide Nanoparticles was shown to be comparable to that of conventional ascorbic acid. As a result, zinc oxide Nanoparticles derived from *Phoenix dactylifera* have a strong free radical scavenging activity.

Keywords: Phoenix Dactylifera , Dates , Antioxidant Property , DPPH assay, SEM analysis .

INTRODUCTION:

Global production figures indicate that dates are becoming a more sought-after item for commerce, offering a healthy financial return(1).Additionally, academic interest in researching various facets of the date tree and its fruit with state-of-the-art methodology has grown. Recent studies have looked at the phytochemicals, antioxidant capacities, and health advantages of popular dried fruits like dates(2). The high content of simple carbohydrates, including glucose, fructose, and sucrose, in date fruits gives (1)them quick and sustained enegy(3) . Along with potassium, a good amount of fiber, and other nephroprotective ingredients. Antioxidants, antimicrobials, nephroprotective, gastroprotective, hepatoprotective, immunostimulant, and antimutagenic properties all work against cancer. Through a variety of scientific methods, such as metabolomics research, the antioxidant property appears to be particularly interesting and is presently being studied on multiple fronts (4)."Nanotechnology" is the development, exploitation, and utilization of atomic or molecular aggregates with sizes between one and one hundred nanometers(5). Treatment of diseases is becoming more and more dependent on nanomedicine. Zinc oxide nanoparticles have gained global attention due to their exceptional physical, chemical, and biological characteristics. ZnO nanoparticles have recently been produced by employing ultrasonic, co-precipitation, electrophoretic deposition, and other techniques. Plants generate new medicinal chemicals and secondary metabolites that are beneficial to human health and cause no harm. The primary reason for the importance of plant-mediated biological nanoparticle synthesis is its eco-friendliness(6,7). Antioxidants mediate several metabolic activities, including the suppression of free radicals, the modification of the intracellular redox state, and the decrease in the production of reactive oxygen species (ROS). To offset every free radical produced by the body, endogenous antioxidants are not enough. This study assessed the zinc oxide nanoparticles' antioxidant capacity after producing them from *phoenix dactylifera* extract and characterizing them.

MATERIALS AND METHODS:

EXTRACT PREPARATION

The dates of the mabroom were found. 100 milliliters of filtered water with two grams of dates in it. Spent thirty minutes submerged in water at 80°C. Whatman filter paper was used for the extraction filter (8).

SYNTHESIZE OF ZnONPs :

Mix 50ml of distilled water with 0.287 g of zinc sulphate. Mix 50 milliliters of zinc sulfate solution with 50 milliliters of dates extract. 10,000 rpm centrifuged for five minutes.

CHARACTERIZATION:

The presence of nanoparticles was confirmed by scanning electron microscope images. The device has an intuitive graphical user interface, making it easy to use. It has an auto coater that, depending on the kind of sample, automatically modifies the coating time.

ANTIOXIDANT ACTIVITY ANALYSIS:

The antioxidant potential of biogenically produced zinc oxide nanoparticles was evaluated using the DPPH test. Similar hydrazine is produced when the hydrogen atom of the antioxidant is taken up by the DPPH odd electron(9).
DPPH makes it easy and quick to test antioxidant capacity with a spectrophotometer (10). One milliliter of 0.1 millimeter of DPPH in methanol, four hundred milliliters of 50 milliliters of Tris HCl buffer (pH 7.4), and various amounts of Mabroom dates extract (10µL, 20µL, 30µL, 40µL, and 50µL) that contained zinc oxide nanoparticles were mixed and allowed to incubate for half an hour. The absorbance at 517 nm was then used to calculate the drop in DPPH free radicals. Ascorbic acid was used as standard technique.

The following equation was used to calculate the percentage of inhibition:

% inhibition= Absorbance of control- Absorbance of test sample × 100 Absorbance of control

RESULTS:

To mark surface morphology, SEM examination was typically utilized. Images from SEM at several magnifications of zinc oxide nanoparticles are displayed in Figures 1,2 and 3 .The image unmistakably displays nanoparticles with approximately spherical and hexagonal shapes.GRAPH 1 demonstrate how the radical scavenging activity of zinc oxide nanoparticles produced from plant extract increased. ZnO nanoparticles demonstrated anti-oxidant activity that was almost identical to that of regular vitamin C, and if they were further functionalized or altered, that activity might rise.

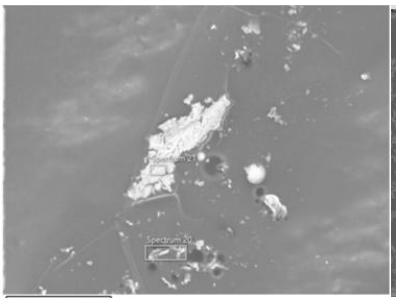


Figure 1

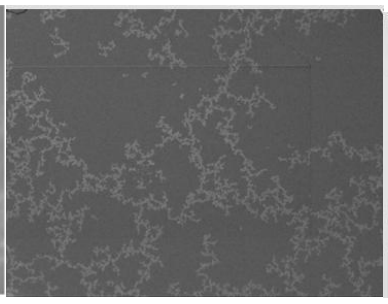


Figure 2

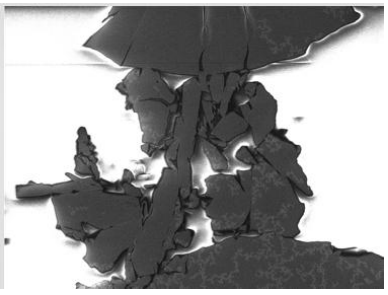
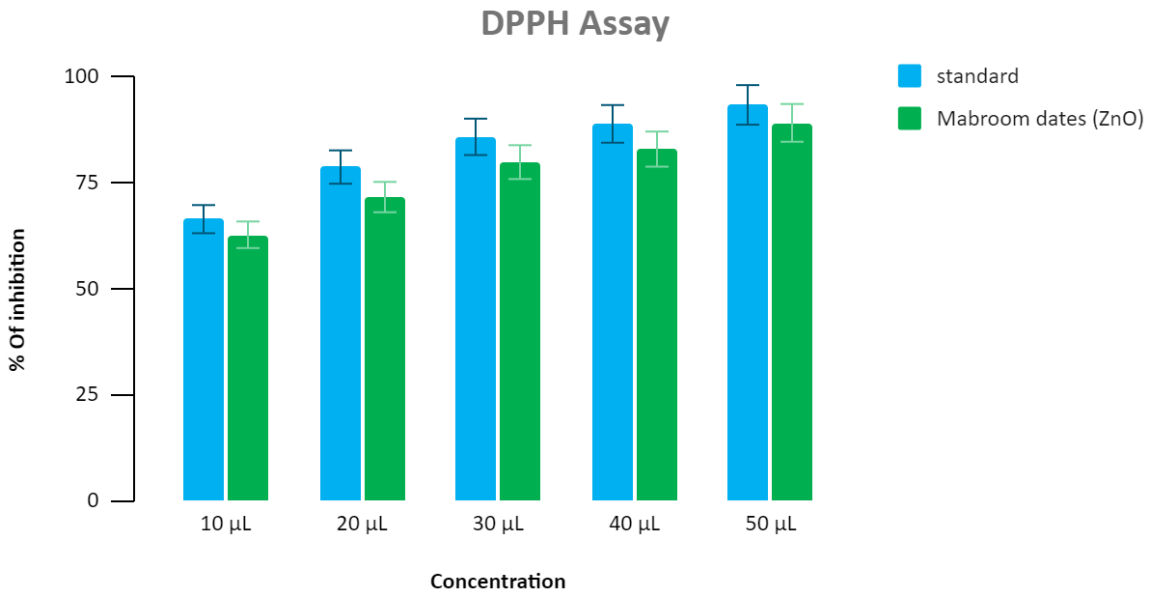


Figure 3



GRAPH 1: DPPH assay to analyze the anti-oxidant property of zinc oxide nanoparticles synthesized using dates

DISCUSSION:

Free radicals are bound to by antioxidant molecules, which then destroy them to prevent on harm. One most important things in managing an illness is to prevent free radical activity. Antioxidant activity is used by medicinal herbs and their constituents to prevent or lessen harm caused by free radicals (11). Research has demonstrated the importance of reactive oxygen species in cancer. As a result of their capacity to counteract these agents, endogenous antioxidants and dietary antioxidants play a crucial role in cancer prevention (12).

Potato plants' total phenolic compounds rose by 1%, 20%, and 22% at ZnO-NP concentrations of 100, 300, and 500 ppm (13).Both Haematococcuspluvialis (microalgae) and Arthrospira platensis (cyanobacteria) showed an increase in phenolic compounds in their extracellular medium following treatment with 100 mg L1 TiO2NP(14). The DPPH assay is commonly utilized to investigate antioxidant activity due to its high sensitivity in detecting active compounds at low concentrations (15). Antioxidant action requires a few bioactive chemicals, most notably vitamins E and C, carotenoids, and polyphenols(16). The anti-oxidant activity was nearly comparable to that of normal vitamin C.It has previously been shown that zinc oxide nanoparticles made using cassia fistula plant extract had anti-oxidant properties(17). By contributing hydrogen or transferring electrons, T. pallida extracts demonstrated their capacity to scavenge radicals(10). According to SEM, the average size was 60 nm. The outcomes matched those of a previous investigation into the production of

zinc oxide nanoparticles by coconut, which found that the average size ranged from 20 to 80 nm (18).

CONCLUSION:

The synthesis of ZnO nanoparticles at the nanoscale can be achieved more effectively with *Phoenix Dactylifera extract*, according to our results. Through SEM analysis, the resulting ZnO nanoparticles' form was ascertained. A DPPH study found that biosynthesised ZnO nanoparticles exhibit antioxidant properties. This allows for a quicker pace of further research into their possible pharmaceutical applications.

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