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Abstract

1DQRSDUWLFOHV DUH RI JUHDW VFLHQWL¿F LQWHUHVW DV WKH\ DUH HIIHFWLYH PROHFXODU VWUXFWXUHV 1DOLGL[LF DFLG LV WKH ¿UVW V\QWKHWLF TXLQRORQH particles, is prepared by ultrasonic method in tetrachloride carbon solvent. The produced nalidixic acid nanoparticles were characterized by X-ray Diffraction (XRD), Infrared Spectroscopy (IR), Scanning Electron Microscope (SEM), DQG RWKHU WHFKQLTXHV 7KH DQWLEDFWHULDO DFWLYLWLHV RI QDQRSDUWLFOH

Keywords: Preparation; Nalidixic acid; Nanoparticles; Biological properties; Tempeh; Lactic acid bacteria; Antimicrobial activity; Antibiotic resistance; Fermented

Introduction

In the eld of medicine, nanoparticles are being explored extensively because of their size dependent chemical and physical properties. is makes them an interesting candidate for application, both in vivo and in vitro biomedical research. e result of their integration in the eld of medicine has led to their application mainly in targeted drug delivery, imaging, sensing, and arti cial implants. Another advantage of nanoparticles in medicine is their use as antimicrobials to target highly pathogenic and drug resistant microbes [1]. Nanoparticles exhibited higher antimicrobial activity than micro scale drugs [2,3].

A bulk material should have constant physical properties regardless of its size, but at the nano scale size-dependent properties are o en observed. us, the properties of materials change as their size approaches the nano scale and as the percentage of atoms at the surface of a material becomes signi cant. For bulk materials larger than one micrometer, the percentage of atoms at the surface is insigni cant in relation to the number of atoms in the bulk of the material. e interesting and sometimes unexpected properties of nanoparticles are, therefore, largely due to the large surface area of the material, which dominates the contributions made by the small bulk of the material. Nalidixic acid (1-Ethyl-1,4-dihydro-7-methyl-4-oxo-1,8-naphthyridine-3-carboxylic acid) is a 4-Quinolone antibacterial agent. Quinolones as a class of antibacterial agents have been known for over 40 years [4]. Quinolone derivatives have been known to possess a variety of biological activities such as antimicrobial, cytotoxic, anti-in ammatory, antiviral, antibacterial and antiHIV [5]. Nalidixic acid has been used for selective decontamination of the gut in this patient population, either as a component of a four-drug regimen [6,7] or as part of a sequential alternating regimen [8-22].

e present study was undertaken to investigate the antibacterial e ect of nanoparticles of nalidixic acid against two Gram-positive species, Staphylococcus aureus and Bacillus subtilis. Nalidixic acid is e ective against both Gram-positive and Gram-negative bacteria. In lower concentrations, drugs that prevent bacterial growth and reproduction, but do not necessarily kill them. e main purpose of the present investigation was developing a new process to prepare nano

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subtilis, have been determined. e method used tubes of growth broth containing a test level of preservative, into which nalidixic acid

fusing back to one large particle decreases the total energy, favorable in thermodynamic. e change in the distance among atoms of particles will have the same impact on the properties of substances. erefore, the synthesized nano particles have the capability of being more antibacterial, in comparison to their normal forms.

Acknowledgement

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to a concentration of 30 g/ml (in ethanol), with sterile distilled water in a 10-well micro-plate. A similar twofold serial dilution of gentamycin (Sigma) was used as positive control against each bacterium. One hundred microliters of each bacterial culture was added to each well. e plates were covered and incubated overnight at 35-37°C. Bacterial growth in the wells was indicated by a red color, whereas clear wells indicated inhibition.

e obtained results have been shown that nanoparticle has inhibited the microbial activity much more that the micro nalidixic acide, resulting in a smaller dose of nanoparticles to inhibit the growth of the bacteria.

Solubility of nano nalidixic acid

Importance of solubility in pharmaceutical preparations is very important. If a drug is not getting dissolved or miscible in vehicle, then it becomes very di cult to administer it and hence forth, it shows poor bioavailability [23-28]. One of the problems of nalidixic acid is its very low aqueous solubility [29]. Importance of solubility enhancement is for the absorption of drug from the site of absorption. Poor water soluble drug shows poor bioavailability and vice-versa [30-32]. e size of the solid particle in uences the solubility, because as a particle becomes smaller, the surface area to volume ratio increases of the particle. e larger surface area allows a greater interaction with the solvent. Increased aqueous solubility with the nanoparticle size increases the e ciency, and/or reducing side e ects for certain drugs.

Conclusion

In this paper, an attempt has been made to build nano drug with new method. Drugs by having the unique property of ultrasonic waves are transformed into nano, by the use of ultrasonic device. Nanoparticles would be recognized with the use of spectroscopic techniques. e size of particles was measured by using the current relations and methods like XRD and SEM. In addition, the antibacterial and antifungal properties of these substances were studied both in normal and nano conditions. e result nanoparticles have antibacterial activities more than bulk (non-nano) form. When substances are transformed into nano forms, the proportion of surface to volume will be increased. is is because the increased surface energy due to the smaller particles,

21. 'KXPDO 56 %LUDGDU 69 <DPDPXUD 6 3DUDGNDU $5 <RUN 3 3UHSDUDWLRQ of amorphous cefuroxime axetil nanoparticles by sonoprecipitation for enhancement of bioavailability. Eur J Pharm Biopharm 70: 109-115.

22. 9HUPD 6 .XPDU 6 *RNKDOH 5 %XUJHVV '- 3K\VLFDO VWDELOLW\ RI nanosuspensions: Investigation of the role of stabilizers on Ostwald ripening. Int J Pharm 406: 145-152.

23. 1DELSRXU + 6\QWKHVLV LGHQWL¿FDWLRQ DQG DQWLEDFWHULDO DFWLYLW\ RI QHZ sulfonamide nanoparticles. IEEE Trans Nanobioscience 11: 296-303.

24. Nabipour H, Ghammamy S, Rahmani A (2011) Synthesis of a new dithiocarbamate cobalt complex and its nanoparticles with the study of their biological properties. Micro Nano Lett 6: 217-220.

25. Aslani A, Morsali A, Zeller M (2008) Nano-structures of two new lead(II) coordination polymers; new precursors for preparation of PbS nano-structures. Solid State Sciences 10: 1591-1597.

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