“Aspects in improvement of some functional foods using bio-synthesized nanoparticles”

A Thesis submitted for the degree of Doctor of Philosophy in Science in Microbiology

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2022

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LIST OF ABBREVIATIONS

Abbreviation	Full term
°C	Celsius grade
AB assay	Alamar blue
ADA	American Dietetic Association
ATCC	American type culture collection
Bas	Biogenic amines
Cfu/gm	Colony-forming unit per gram
Cu	Cupper
DAO	Diamine oxidase
Dm	Decimetre
Dm^3	Cubic decimeter
DNA	Deoxyribonucleic Acid
Etc	Et cetera is a Latin phrase meaning and other similar things
et al	Comes from the Latin phrase meaning: and other
FAO	Food and Agriculture Organization of the United Nations
$FeCl_2.4H_2O$	Ferrous chloride Tetrahydrate
$FeCl_3$:$6H_2O$	Ferric chloride hexahydrate
$FeSO_4.7H_2O$	Ferrous sulfate heptahydrate
GI	Gastrointestinal
HCL	Hydrochloric Acid
HIV/AIDS	The human immunodeficiency virus is what ultimately causes AIDS (acquired immunodeficiency syndrome)
HPLC	High-performance liquid chromatography
Hrs	Hours
IONPs	Iron oxide nanoparticles
ITS	Internal transcribed spacer
K_2HPO_4	Dipotassium Phosphate
KCL	Potassium Chloride
Kg	Kilogram
LAB	Lactic acid bacteria
MAO	Mono-amino oxidase
Mg	Milligram
$MgSO_4.7H_2O$	Magnesium Sulfate (Sulphate) Heptaydrate
Min	Minute
Ml	Millilittre

Abbreviation	Full term
Mm	Millimeter
MNPs	Magnetite nanoparticles
MSNs	Mesoporous silica nanoparticles
MTT assay	3-(4,5-dimethylthiazol-2- yl)-2,5-diphenyltetrazolium bromide
NaCl	Sodium chloride
$NaHCO_3$	Sodium bicarbonate
$NaNO_3$	Sodium Nitrate
NH_4OH	Ammonium hydroxide
NPS	Nanoparticles
NRU assay	Neutral red uptake
O.D	Optical density
PAO	Polyamine oxidases
PDA	Potato dextrose agar
r DNA	Ribosomal deoxyribonucleic acid
g- DNA	Genomic deoxyribonucleic acid
ROS	Reactive oxygen species
Rpm	Revolutions per minute
SDS	Sodium dodecyl sulphate
SEM	Scanning electron microscope
Si-IONPs	Nanocomposite of iron oxide nanoparticles modified by silica
SiO_2	Silica dioxide
TEM	Transmission electronic microscope
TEOS	Tetra-ethyl orthosilicate
UV	Ultra violet spectrophotometer
WHO	World Health Organization
XRD	X-ray diffraction
ZnO	Zinic oxide
A	Alpha
Γ	Gamma
Mg	Microgram
Ml	Microliters

ABSTRACT

Nowdays, nanotechnology has received a lot of attention resulted in a wide application in medical environmental science, agriculture and food processing. Thereforce, the aim of the present study was to investigate a novel antimicrobial agent such as iron oxide nanoparticles (IONPS) which biosynthesized by a simple, fast, eco-friendly efficient method using *Penicillium roqueforti* MK805460.1. The obtained iron oxide nanoparticles were modified by the shell formed by Stöber method. The biosynthesized nanoparticles were characterized by UV-Vis spectroscopy, Energy Dispersive X-ray, Scanning Electron Microscopy, Transmission Electron Microscopy and X-ray diffraction. Antibacterial activity of the nanoparticles with different concentrations of 50, 100, 150 and 200µg/ ml was examined against Gram-positive bacteria (*Staphylococcus aureus* ATCC25923, *Bacillus subtilis* ATCC6633), and Gram-negative bacteria (*Salmonella typhimurium* ATCC14028, *Escherichia coli* ATCC8739) by agar well-diffusion and kinetic bacterial growth method. While, the antifungal activity of the nanoparticles was tested against *Aspergillus niger*, *Aspergillus fumigatus* and *Aspergillus flavus* using dry weight mycelia method. The cytotoxicity effect of nanocomposite (Si-IONPs) on the normal epithelial cells at Conc. 50, 100,150, and 200 µg/ml was investigated. Furthermore, the present study was evaluated the coating of Ras cheese with polymer contained Si-IONPs (100µg/ml) and its effect on microbiological, physical and chemical characteristics as compared with the untreated cheese samples. Also, the levels of the biogenic amines were determined in treated and untreated cheese samples by HPLC during ripening period (6 months). The results showed that upon UV-Vis spectroscopy analysis, the absorption band was observed at a wavelength ranged from 204 to 266 nm, which indicated the formation of iron oxide nanoparticles. Furthermore, transmission Electron

Microscopy was showed the spherical shape of iron oxide nanoparticles with a size of 5-16 nm. Also, the results indicated that modified silica form of nanoparticles have more significant antimicrobial activity than iron oxide nanoparticles. However, there is no cytotoxicity effect of nanocomposite (Si-IONPs) on the normal epithelial cells at Conc. 50,100, and 150 μg/ml. Coating of cheese decreased the moisture losses and affects the normal ripening changes in the microbiological and chemical of treated Ras cheese samples. Also, coating cheese with polymer film containing Si- IONPs eliminated mold growth on the cheese surface. According to the results of HPLC analysis, no detection of biogenic amines in Ras cheese treated samples, whereas the results illustrated the existence of putrescine, spermine, and tyramine in untreated cheese samples after 2, 4, and 6 months.