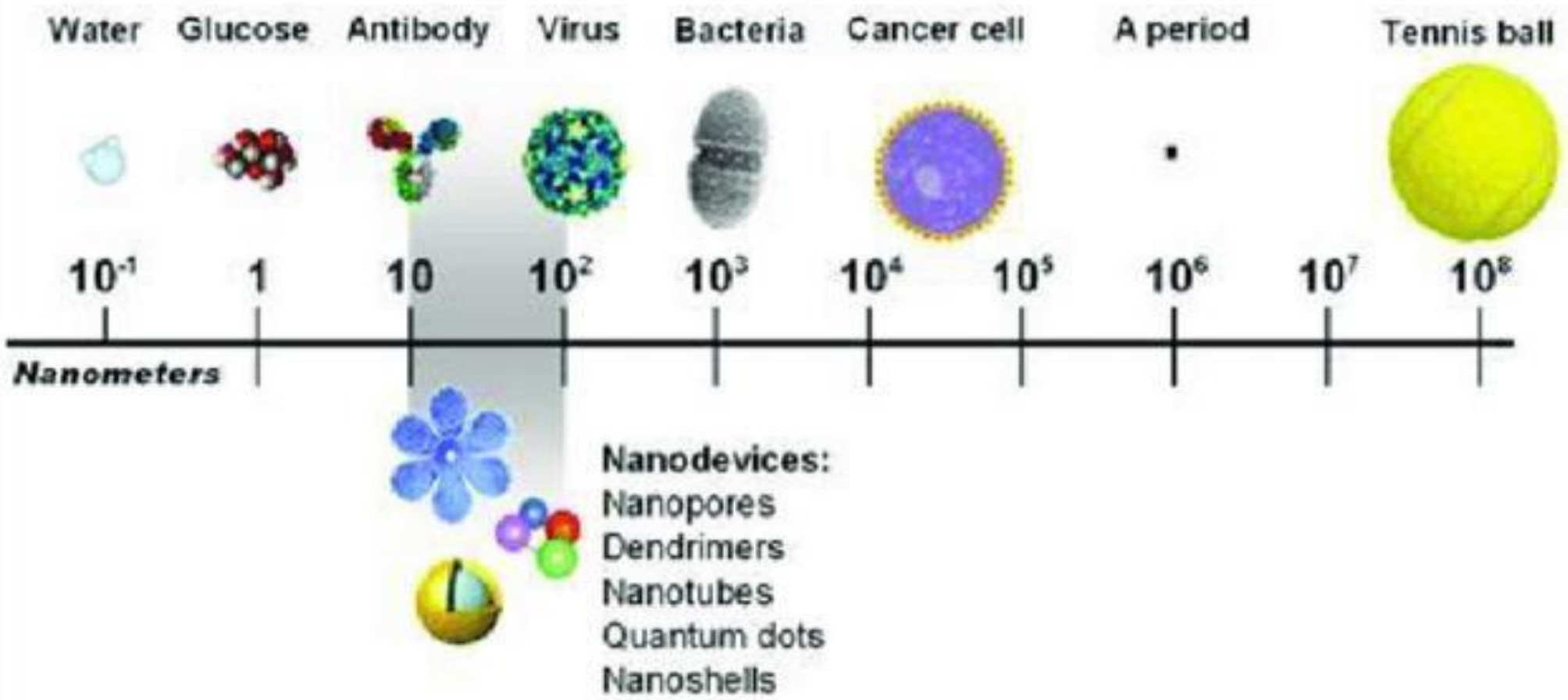
Role of Nanotechnology in Plant Protection

DR. ALAA Y GHIDAN

ASSISTYANT PROFESSOR OF NANOTECHNOLOGY

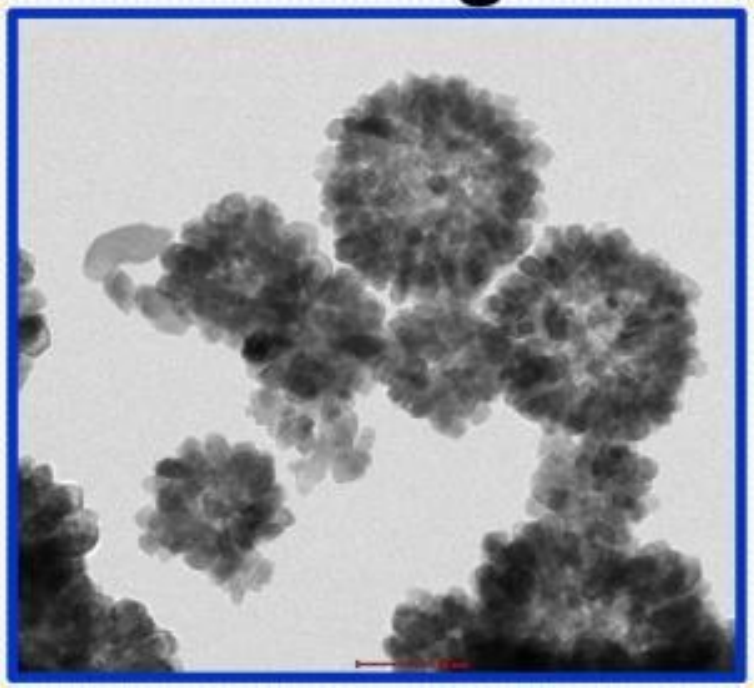
What is Nanotechnology???


Water
Glucose
Antibody
Virus
Bacteria
Cancer cell
A period
Tennis ball
10^{-1}
1
10
10^{2}
10^{3}
10^{4}
10^{5}
10^{6}
10^{7}
10^{8}
Nanometers
Nanodevices:
Nanopores
Dendrimers
Nanotubes
Quantum dots
Nanoshells


TECNAI

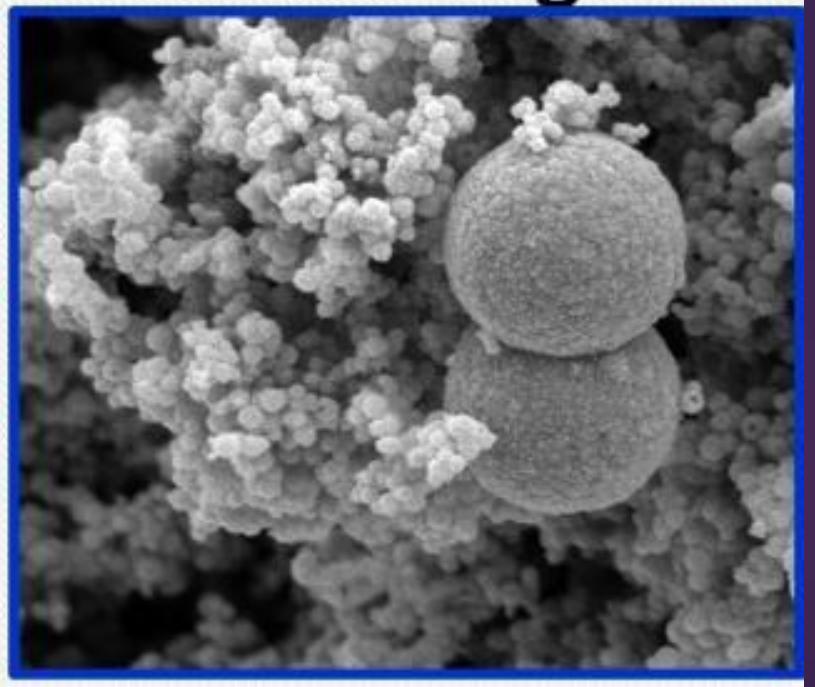
TEM Vs SEM

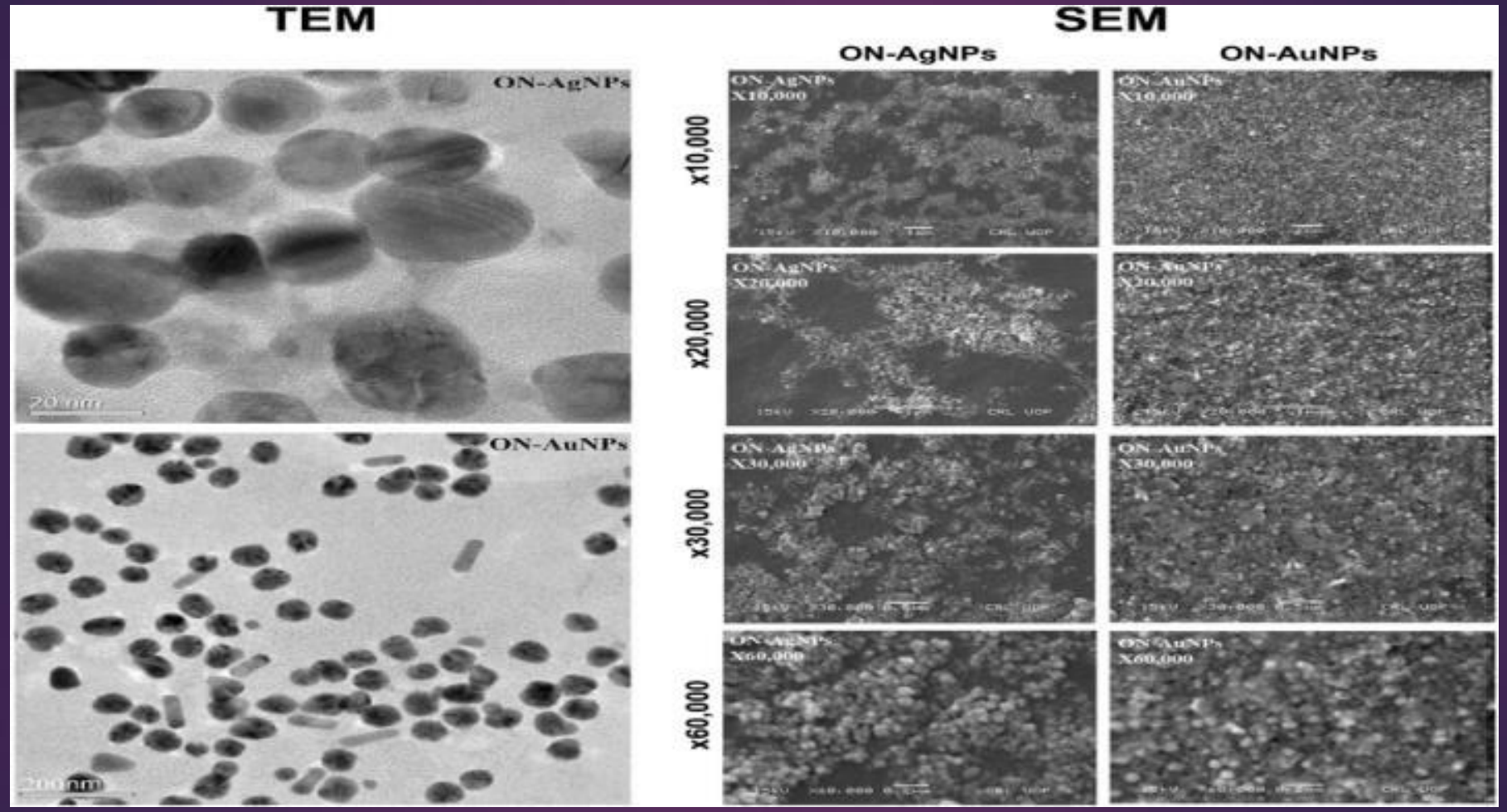
TEM images

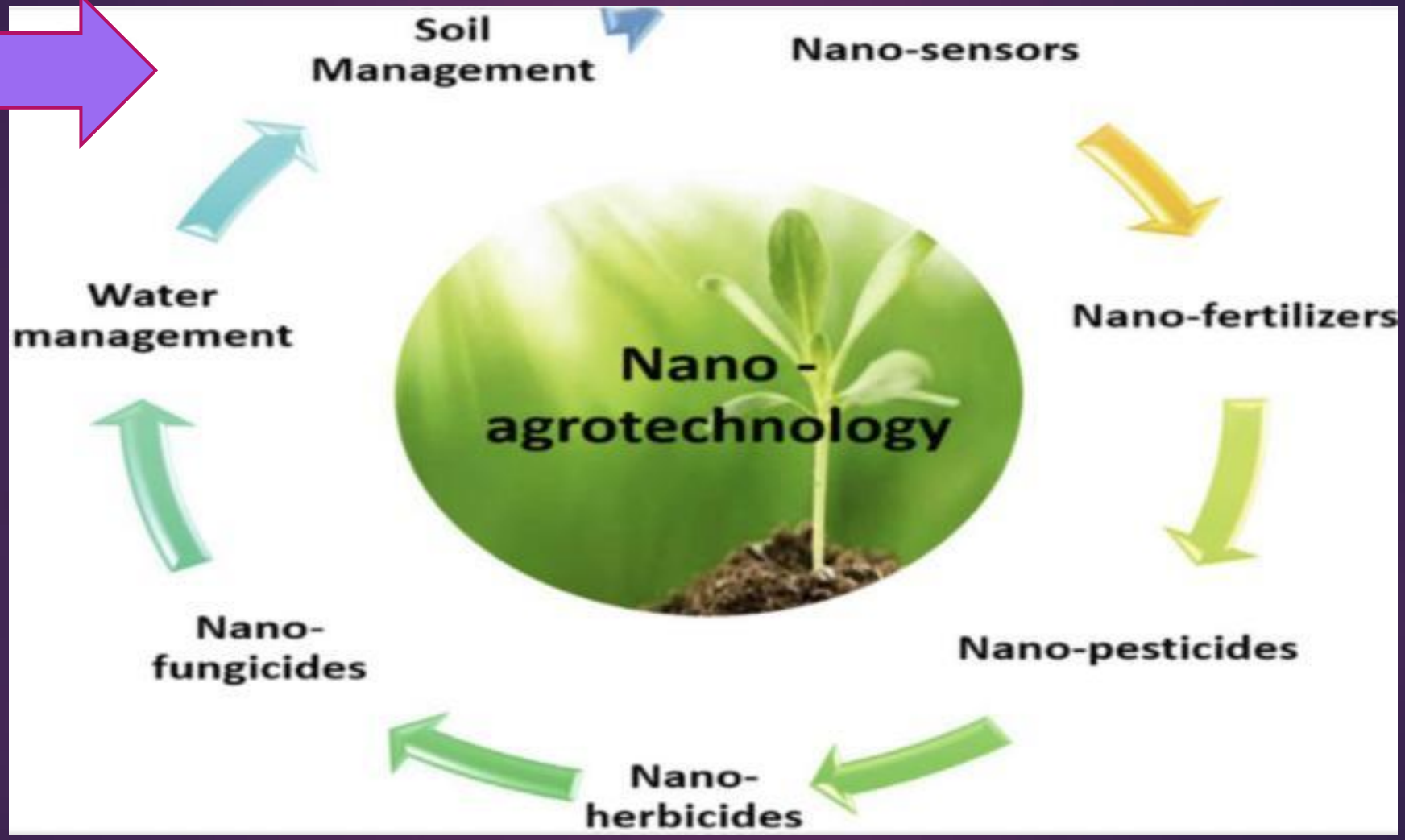


Vs

SEM images

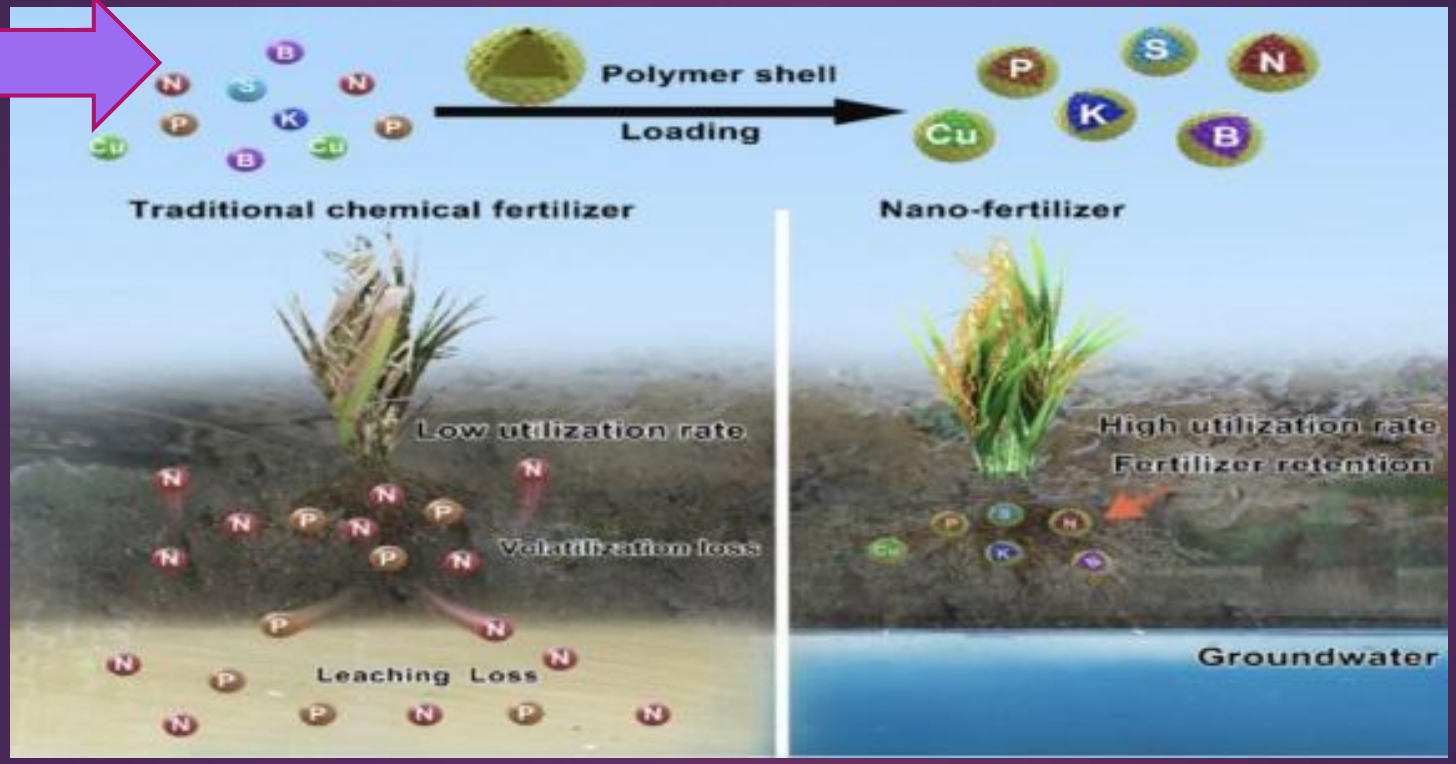



TEM
SEM
ON-AgNPs
ON-AuNPs
ON-AgNPs
ON-AuNPs
x10,000
x20,000
x30,000
x60,000


Soil Management
Nano-sensors
Nano-fertilizers
Nano-pesticides
Nano-herbicides
Nano-fungicides
Water management
Nano - agrotechnology

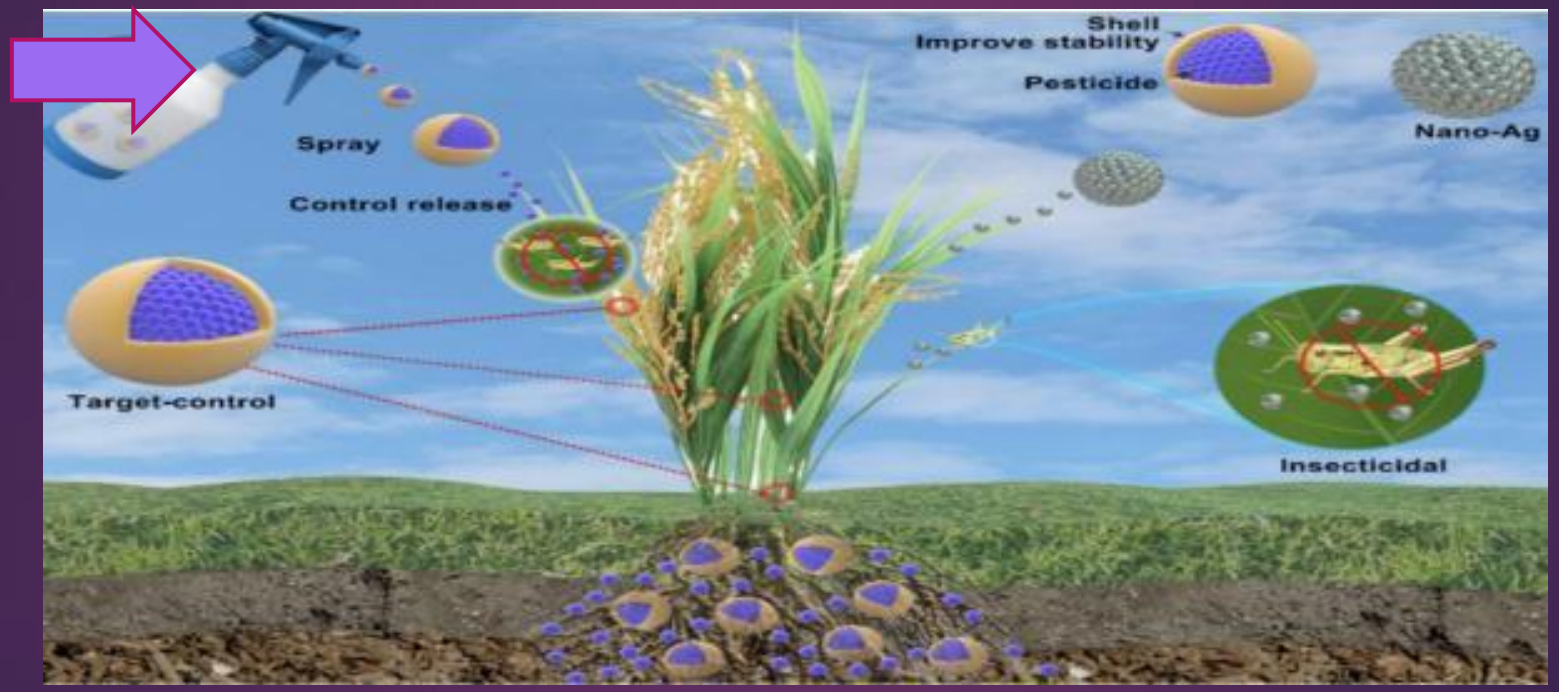

NANOTECHNOLOGY FOR SUSTAINABLE AGRICULTURE
APPLICATION OF NANO FERTILIZER
Soil application
Foliar application
APPLICATION OF NANO BIOSENSOR
Soil quality monitoring
Plant disease monitoring
FOLIAR APPLICATION OF NANO PESTICIDE
Diseased plant
Healthy plant
APPLICATION OF NANO BASED REMEDIATION
Wastewater remediation
Contaminated water
Treated water

Application of Nanotechnology in Plant Protection



Better Crop Growth:
Nanotechnology helps deliver fertilizers and pesticides precisely to crops, making them grow better and resist pests.

Application of Nanotechnology in Plant Protection



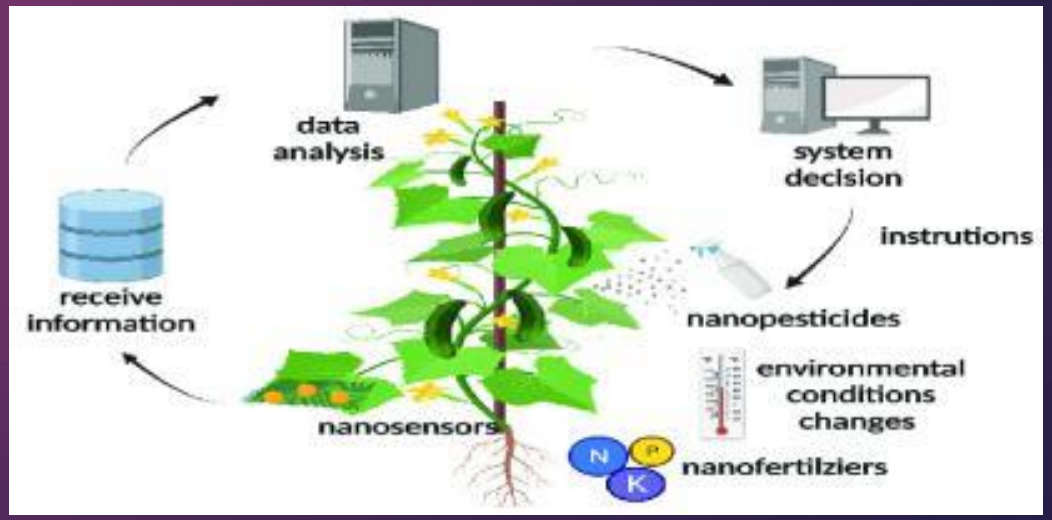
Application of Nanotechnology in Plant Protection

Using Nutrients Efficiently:
Nanotechnology ensures plants absorb nutrients effectively, reducing waste and helping crops grow healthier.

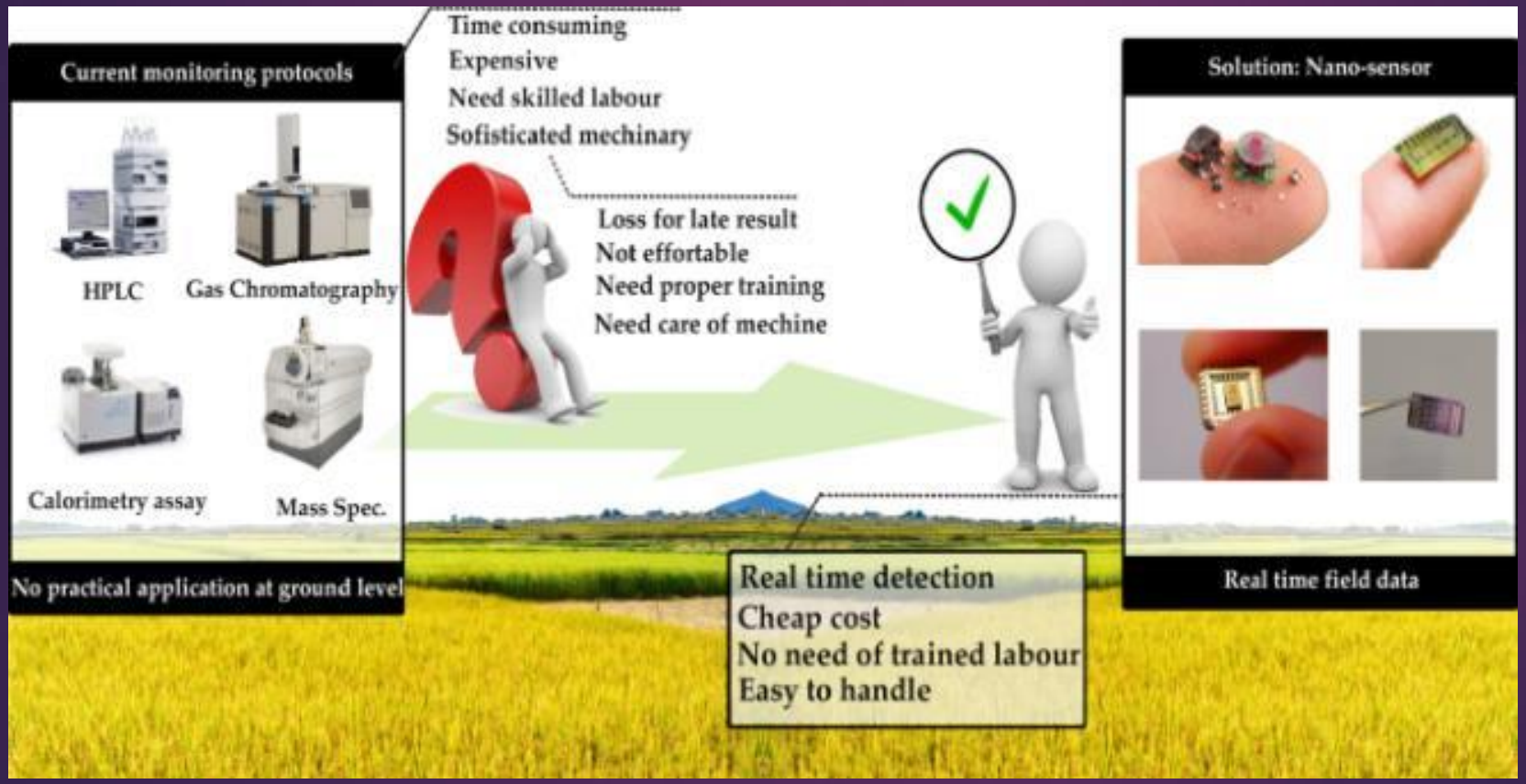
Application of Nanotechnology in Plant Protection

Smart Farming: Tiny sensors monitor soil and crop health, helping farmers use water and chemicals just where they're needed.

Spotting Problems Early: Nano sensors can find plant diseases early, so farmers can fix them before they spread.



Application of Nanotechnology in Plant Protection



Application of Nanotechnology in Plant Protection

Nano sensors used to diagnose disease caused by infecting soil microorganisms, such as

viruses,

bacteria,

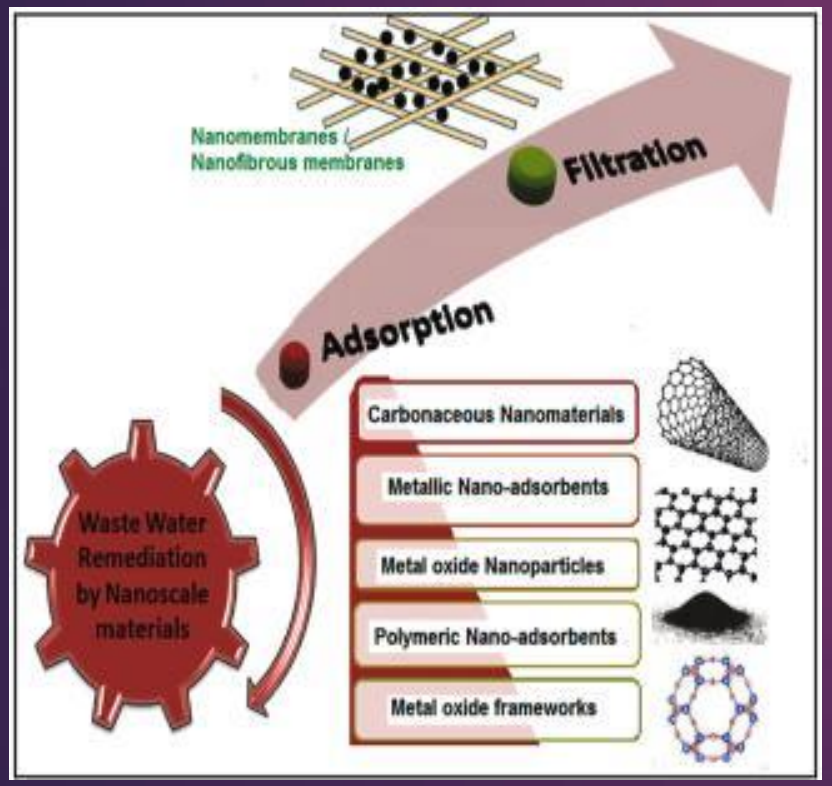
and fungi

via the quantitative measurement of differential oxygen consumption in the respiration (relative activity) of good microbes and bad microbes in the soil. (Rai *et* al., 2012).

Application of Nanotechnology in Plant Protection

Nanotechnology drones, with their compact size, advanced sensors, and nanomaterial-integrated components, redefine data collection, reconnaissance, and surveillance in agriculture, security, and environmental studies.

Application of Nanotechnology in Plant Protection

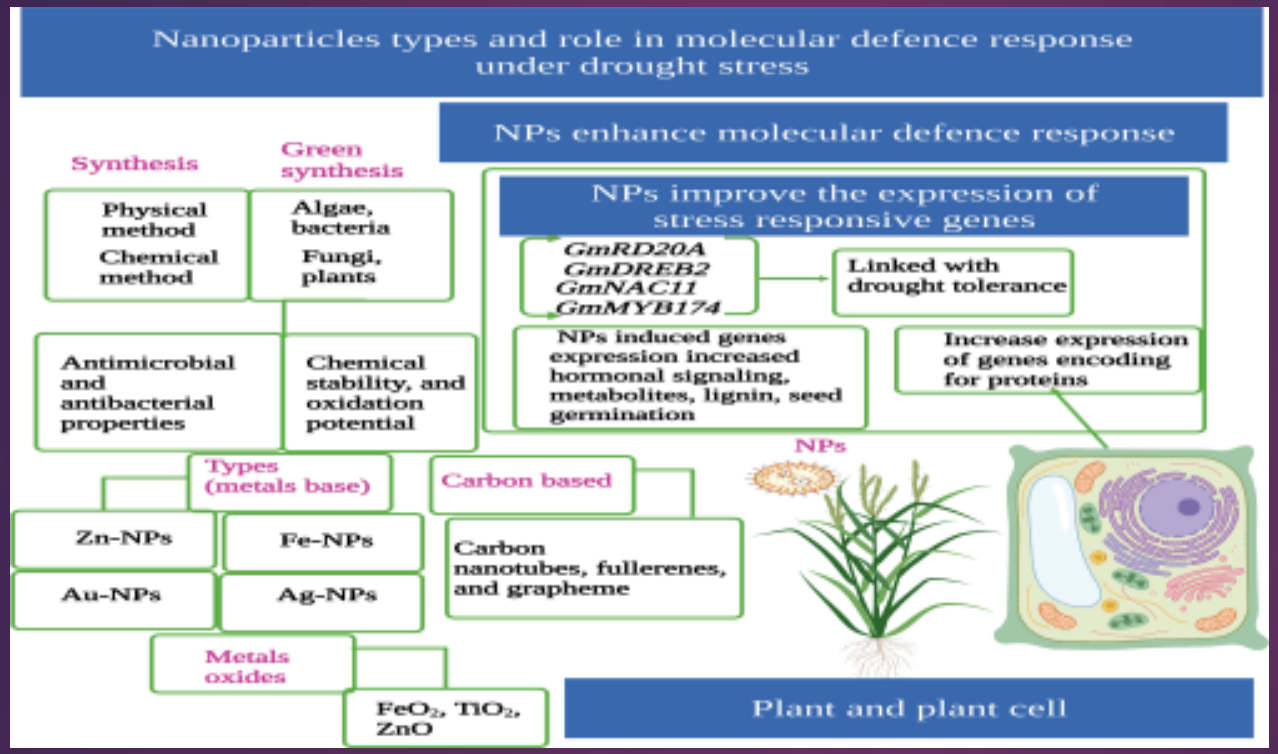


Cleaning up Soil: Nanomaterials clean soil by removing harmful chemicals, making it better for growing crops.

Safer Pest Control: Nanotechnology creates barriers that keep pests away without harmful chemicals.

Saving Water: Nanotech filters clean water for crops, saving water and keeping them healthy.

Application of Nanotechnology in Agriculture

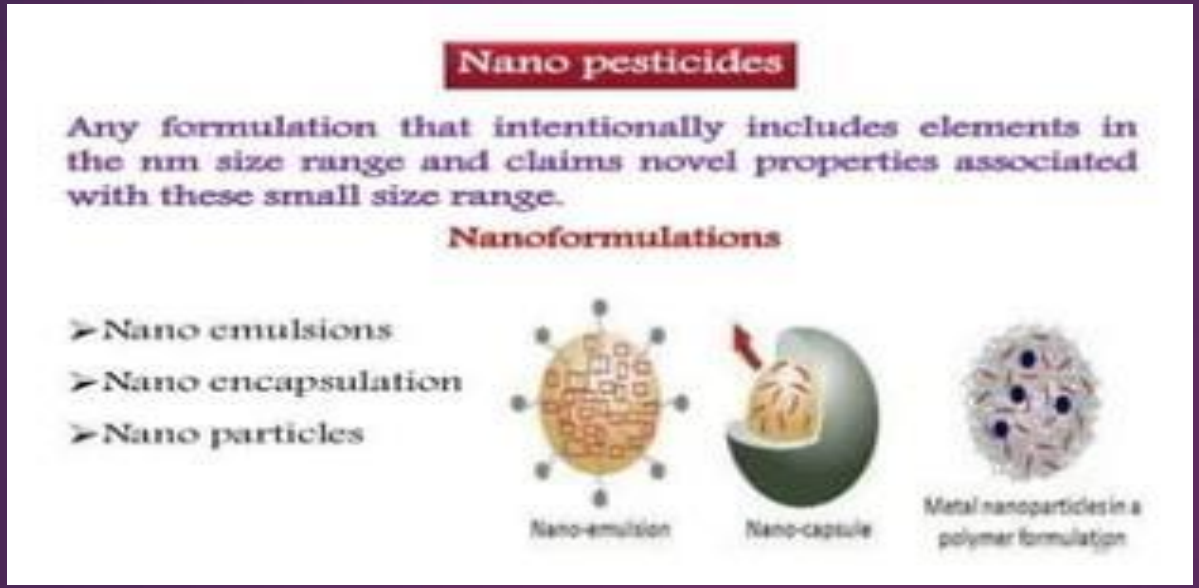


Improving Plant Traits: Nanotechnology helps scientists change plant genes to make them better at surviving droughts or diseases.

Application of Nanotechnology in Plant Protection

Keeping Food Fresh: Nanotech packaging makes food last longer, reducing waste and keeping it safe to eat.

Examples of nanoparticles in Plant protection



Protecting the Environment: By using less water and fewer chemicals, nanotechnology helps farming without harming the environment.

© by PSP Volume 27 – No. 10/2018 pages 7009-7016 Fresenius Environmental Bulletin

COMPARISON OF DIFFERENT GREEN SYNTHESIZED NANOMATERIALS ON GREEN PEACH APHID AS APHICIDAL POTENTIAL

Alaa Y Ghidan[1], Tawfiq M Al-Antary[1,*], Akl M Awwad[2], Osama Y Ghidan[3], Salah-Eddin A Araj[1], Mazen A Ateyyat[4]

[1]School of Agriculture, the University of Jordan, Amman 11942, Jordan
[2]Department of Materials Science, Royal Scientific Society P.O. Box Amman,11941, Jordan
[3]Queensland University of Technology, Analytical Chemistry Technologist,Brisbane, Australia
[4]School of Agricultural Technology, Plant Production and Protection Dept., Al BalqaApplied University, Salt,19117, Jordan

TABLE2

Mortality means for the different tested nanomaterials on early nymphal instars of *M. persicae* after 24 hours treatment.

Nanomaterials	Slope	LC_{50}* (PPM)	95%CL***	LC_{90}** (PPM)	Chi-Square	Pr> Chi-Square
CuONPs	2.7	0.15[a]	0.03 –0.24	0.89[a]	33.31	<.0001
ZnONPs	1.24	0.42[b]	0.04 – 0.51	2.11[b]	3.76	0.050
MgHNPs	2.73	0.15[a]	0.03 – 0.24	0.89[a]	50.03	.0001
MgONPs	0.54	1.24[c]	0.06 – 2.01	2.82[c]	0.98	0.320

*LC_{50} values sharing the same letters do not differ significantly (95% of CL are not overlapping).
**LC_{90} values sharing the same letters do not differ significantly (95% of CL are not overlapping).
***CL confidence limits

TABLE3

Mortality data for the different nanomaterials on late nymphal instars of *M. persicae* after 24 hours treatment.

Nanomaterials	Slope	LC_{50}* (PPM)	95%CL***	LC_{90}** (PPM)	Chi-Square	Pr> Chi-Square
CuONPs	5.15	0.29[a]	0.17-0.45	0.71	16.28	<.0001
ZnONPs	1.67	0.58[ab]	0.36-1.83	1.89	7.62	0.0058
MgHNPs	0.41	0.95[c]	0.39– 1.84	6.25	0.73	0.3900
MgONPs	2.29	0.19[a]	0.04-0.35	1.15	13.34	0.0003

*LC_{50} values sharing the same letters do not differ significantly (95% of CL are not overlapping).
**LC_{90} values sharing the same letters do not differ significantly (95% of CL are not overlapping).
***CL confidence limits

TABLE 4

Mortality data for the different nanomaterials on early nymphal instars of *M. persicae* after 48 hours treatment.

Nanomaterials	Slope	LC_{50}* (PPM)	95%CL***	LC_{90}* (PPM)	Chi-Square	Pr> Chi-Square
CuONPs	3.19	0.02[a]	0.18 - 0.49	0.71[a]	10.160	0.0014
ZnONPs	1.39	0.53[b]	0.21 - 0.96	1.05[b]	0.950	0.33
MgHNPs	0.00	0.53[b]	0.20 - 0.97	1.05[b]	0.0001	0.0001
MgONPs	2.85	0.02[a]	0.14 - 0.65	0.75[a]	9.680	0.0019

*LC_{50} values sharing the same letters do not differ significantly (95% of CL are not overlapping).
**LC_{90} values sharing the same letters do not differ significantly (95% of CL are not overlapping).
***CL confidence limits.

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APHIDICIDAL POTENTIAL OF GREEN SYNTHESIZED MAGNESIUM HYDROXIDE NANOPARTICLES USING *Olea europaea* LEAVES EXTRACT

Alaa Y. Ghidan[1], Tawfiq M. Al-Antary[1], Akl M. Awwad[2] and Muhand W. Akash[3]
[1]Department of Plant Protection, School of Agriculture, the University of Jordan, Amman, Jordan
[2]Department of Materials Science and Nanotechnology, Royal Scientific Society, Amman, Jordan
[3]Department of Horticulture and Crop Science, College of Agriculture, the University of Jordan, Amman, Jordan
E-Mail: akl.awwad@yahoo.com

ABSTRACT

Magnesium hydroxide (MgHNPs) nanoparticles were synthesized using *Olea europaea* aqueous extract at ambient temperature and in one-single step. X-ray diffraction (XRD) analysis showed that synthesized MgHNPs have spherical shape with an average size diameter 40nm. Fourier transform infrared (FT-IR), scanning electron microscopy (SEM) and UV-vis spectrophotometer were used to characterize the synthesized magnesium hydroxide nanoparticles. This study determined the mortality efficacy of different concentrations of the synthesized MgHNPs against early and late nymphal instars of the green peach aphid. There were significant differences in the aphid mortalities between the different concentrations of the MgHNPs nanoparticles. In addition, the differences between the different concentrations and the control were significantly obvious.

Keywords: green synthesis, magnesium hydroxide nanoparticles, *Olea europaea* leaf extract, mortality, green peach aphid.

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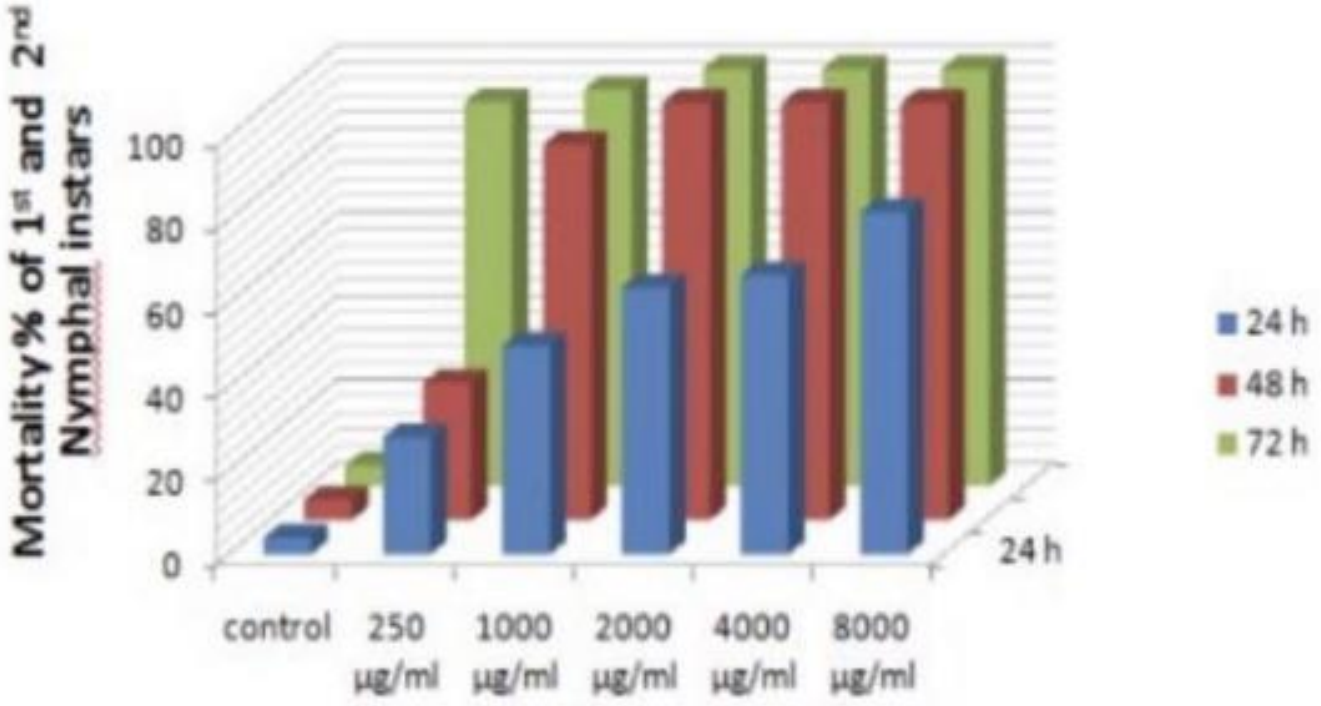

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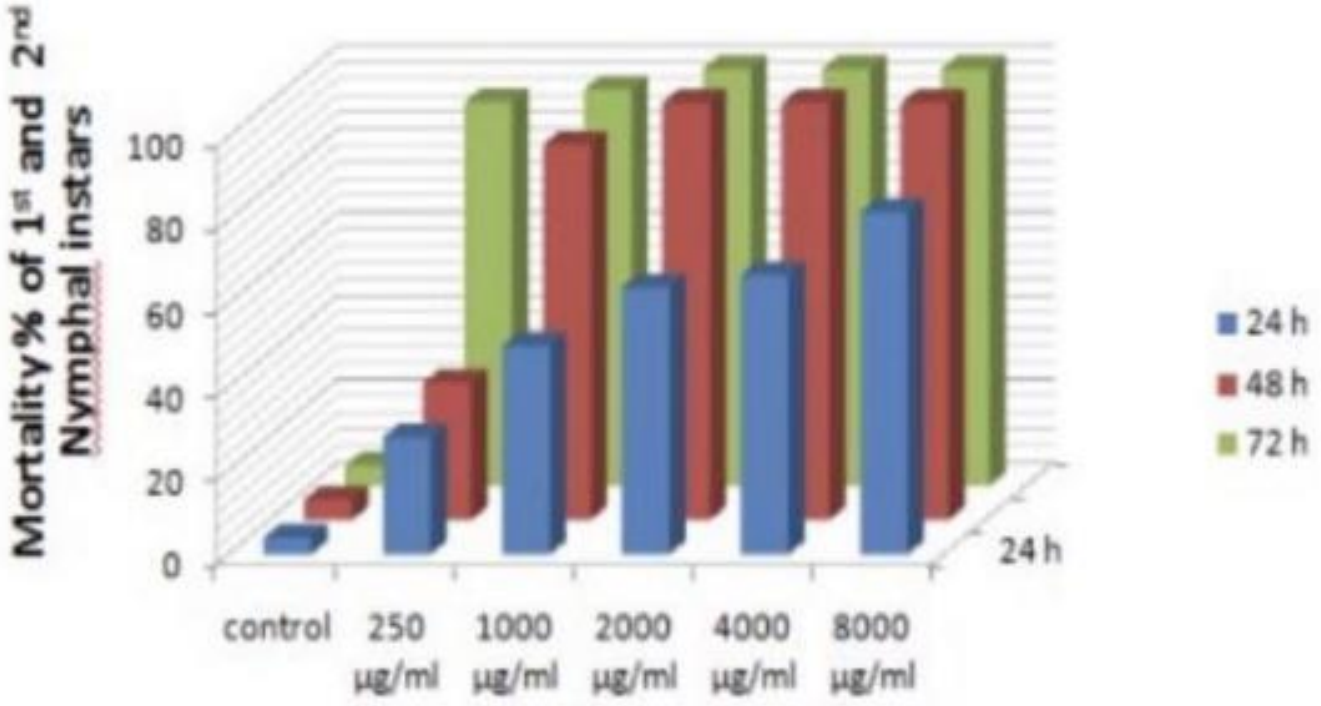

ELSEVIER

Microbial Pathogenesis
Volume 135, October 2019, 103609

Green synthesis, characterization and antibacterial activity of silver nanoparticles by *Malus domestica* and its cytotoxic effect on (MCF-7) cell line

Mariadoss Arokia Vijaya Anand [a], Ramachandran Vinayagam [a], Shalini Vijayakumar [a], Agilan Balupillai [a], Franklin Jebaraj Herbert [b], Sanjay Kumar [b], Alaa Y. Ghidan [c], Tawfiq M. Al-Antary [c], Ernest David [a]

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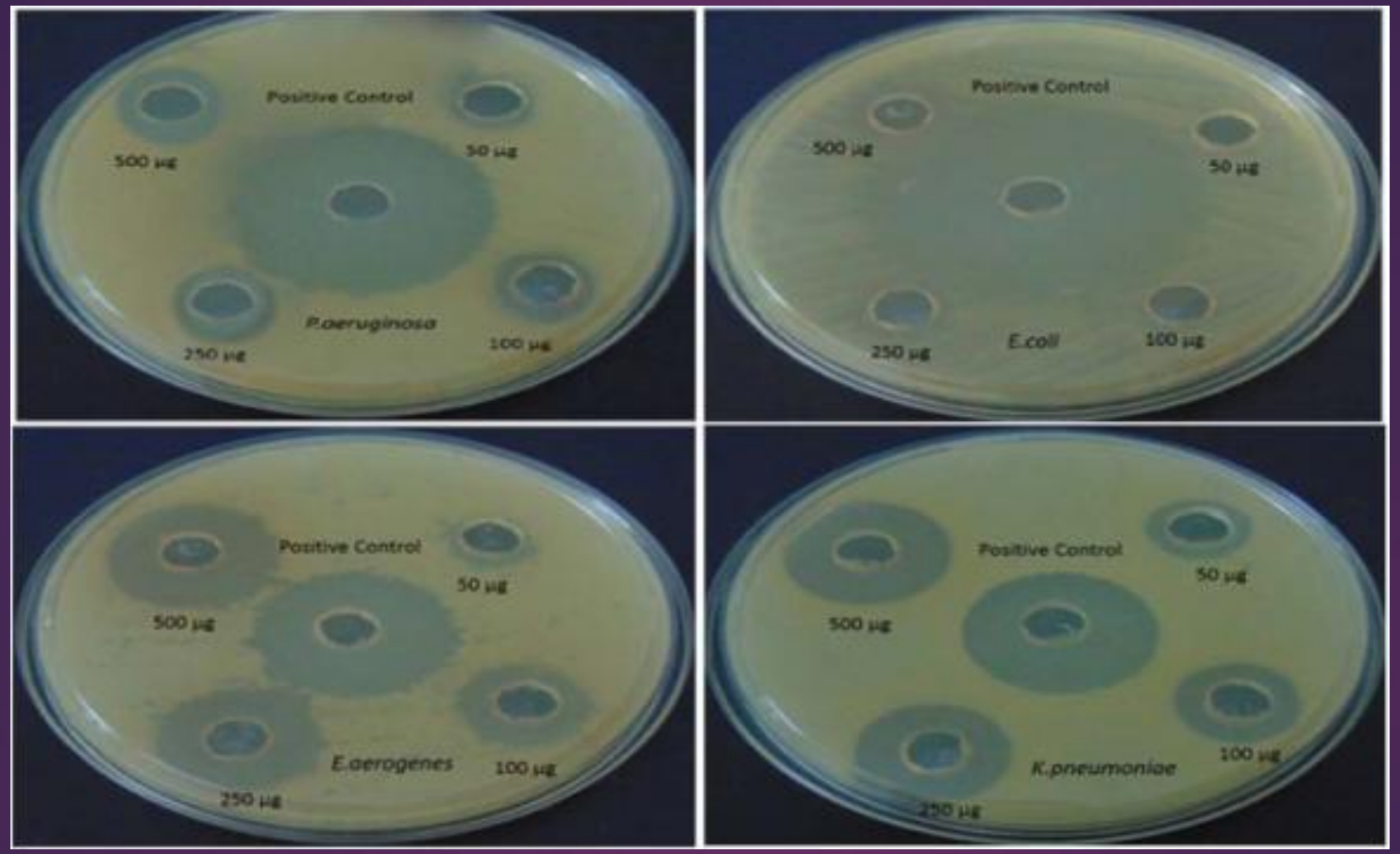
Positive Control
500 µg
50 µg
P.aeruginosa
250 µg
100 µg
Positive Control
500 µg
50 µg
250 µg
E.coli
100 µg
Positive Control
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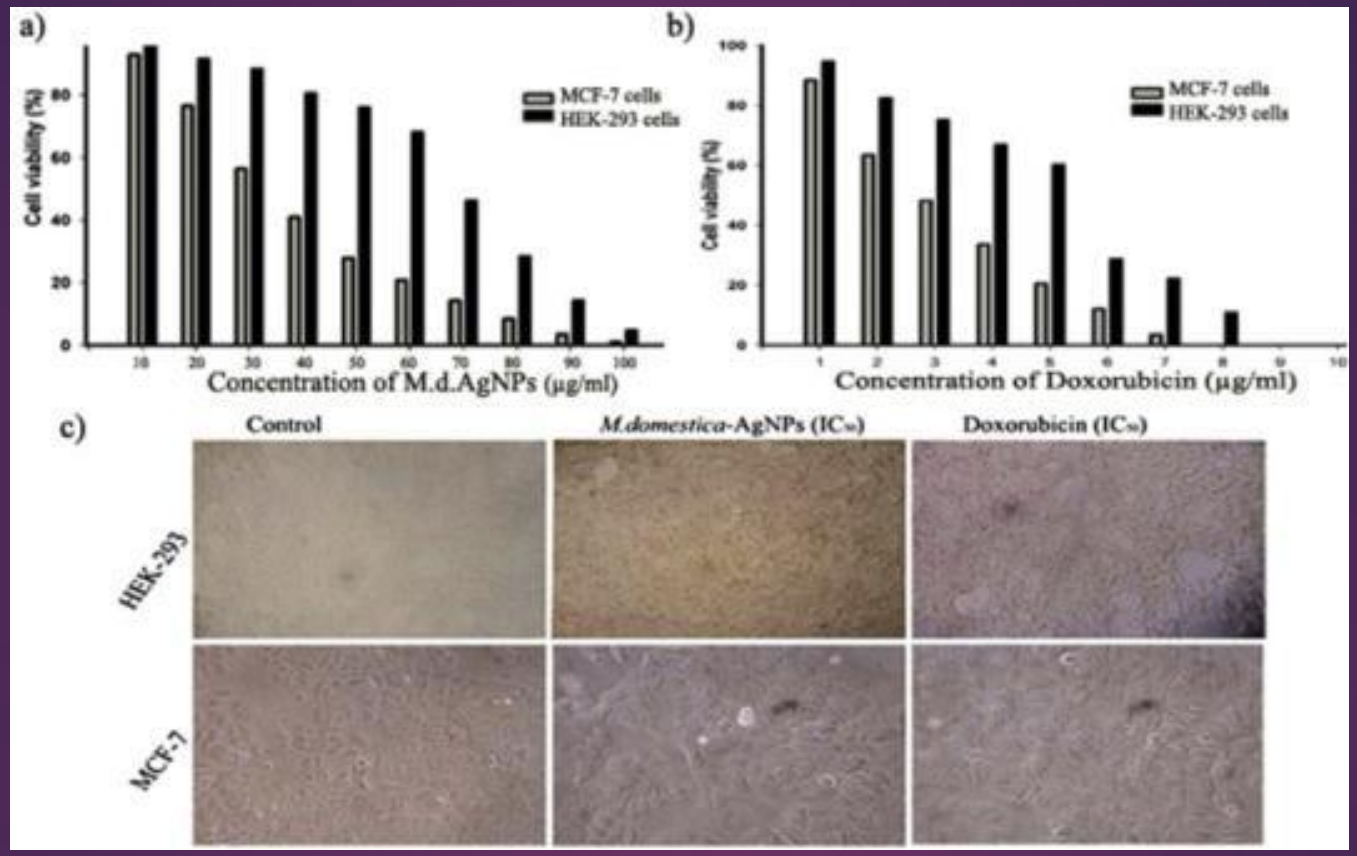
500 µg
E.aerogenes
100 µg
250 µg
Positive Control
50 µg
500 µg
K.pneumoniae
100 µg
250 µg


a)
Cell viability (%)
MCF-7 cells
HEK-293 cells
Concentration of M.d.AgNPs (µg/ml)
b)
Cell viability (%)
MCF-7 cells
HEK-293 cells
Concentration of Doxorubicin (µg/ml)
c)
Control
M.domestica-AgNPs (IC50)
Doxorubicin (IC50)
HEK-293
MCF-7

OPEN ACCESS PEER-REVIEWED CHAPTER

Applications of Nanotechnology in Agriculture

WRITTEN BY

Alaa Y. Ghidan and Tawfiq M. Al Antary

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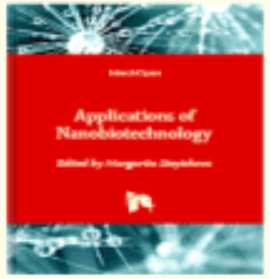

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Introduction

Nanotechnology, with eco-friendly methods and working now as nanopesticides, nanofertilizers, nano anitmicrobial activity and nano anticancer.

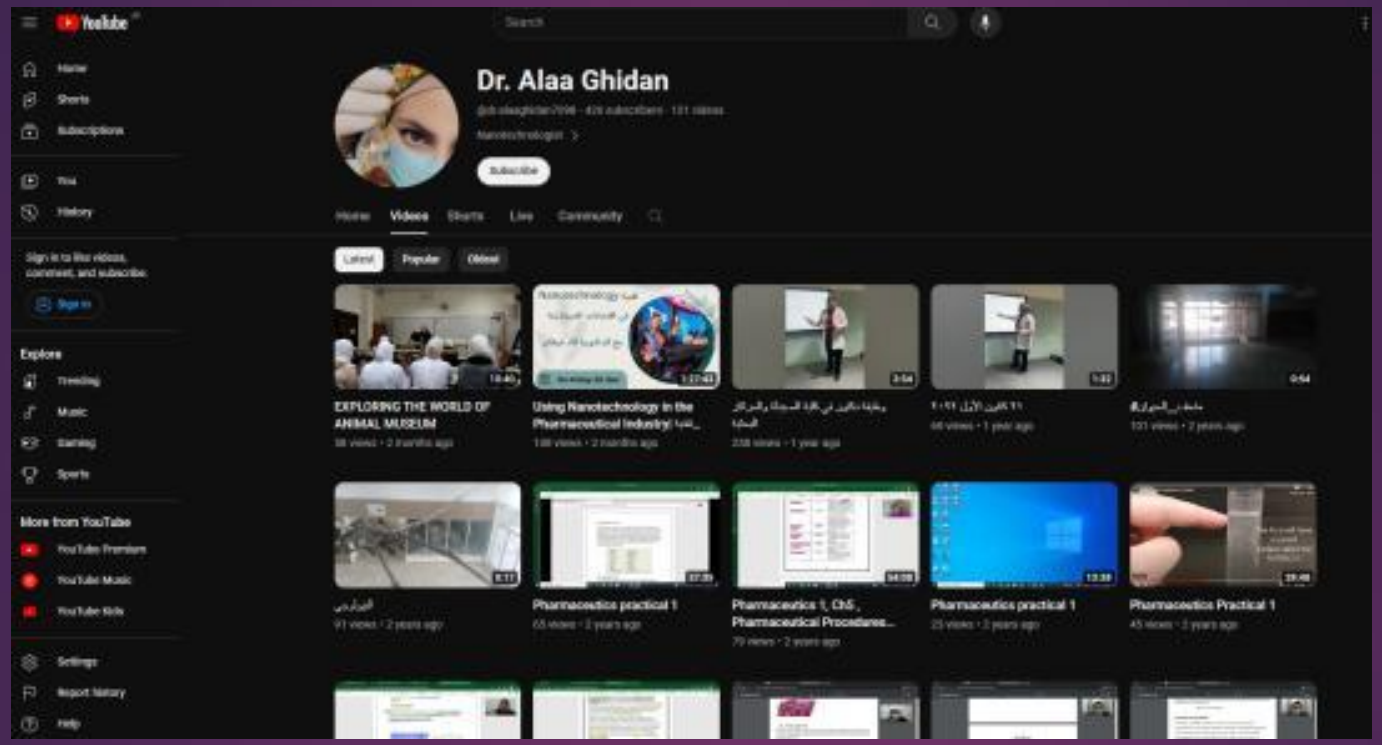
Current institution

University of Jordan

Department of Biological Scienc...

Current position
Assistant Professor of Nanotechnology and Microbiology

Ernest David's Lab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