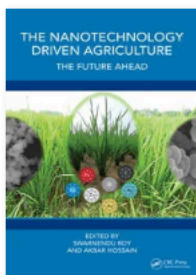


THE NANOTECHNOLOGY DRIVEN AGRICULTURE THE FUTURE AHEAD



EDITED BY
SWARNENDU ROY
AND AKBAR HOSSAIN





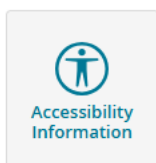
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The Future Ahead

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TABLE OF CONTENTS

Chapter 1 | 27 pages

Recent Developments and Applications of Nanocomposites in Agriculture

Properties, Benefits and Prospects

By Edgar Vázquez-Núñez, Ileana Vera-Reyes, Alma Serafín-Muñoz, Hermes Pérez-Hernández, Alonso Méndez-López

[Abstract](#) ▾

Chapter 2 | 22 pages

Synthesis of Nanofertilizers and Nanopesticides

Current Understanding and Future Prospects

By Aneesa Batool, Saika Bashir, Jebi Sudan, Momina Nazir, Gulam Nabi Yattoo, Anuj Ranjan, Vishnu D. Rajput, Parvaze A. Sofi, Zahoor Ahmad Bhat, Khurshed Hussain, Firdose A. Malik, Sajad Majeed Zargar

[Abstract](#) ▾

Chapter 3 | 17 pages

Applications of Nanotechnology in Abiotic Stress Management and Biofortification

By Debojyoti Moulick, Fiza Rashida Khan, Nafisa Siddiqui, Jyotirmayee Pradhan, Pragya Khamari, Subrata Mahanta

[Abstract](#) ▾

Chapter 4 | 18 pages

Prospects of Nanotechnology for Abiotic and Biotic Stresses Amelioration in Field Crops

By Zahoor Ahmad, Ejaz Ahmad Waraich, Celaleddin Barutçular, Sarfraz Ahmed, Muhammad Aamir Iqbal, Amir Aziz, Muhammad Adnan Bukhari, Amber Raza, Muhammad Ahmad, Shehar Bano

Abstract 

Chapter 5 | 21 pages

Nanoparticles in Soil–Water–Plant Inference

By Binaya Kumar Pattnaik, Chandan Sahu, Debojyoti Moulick

Abstract 

Chapter 6 | 11 pages

Nanopriming

A Comprehensive Perspective for Regulating Seed Germination of Crops Under Stress Conditions

By Harsita Nayak, Satyabrata Mangaraj, Shriram Ratan Pradhan, Rabindra Kumar Paikaray, Akbar Hossain

Abstract 

Chapter 7 | 21 pages

Perspectives of Nanoparticles as Priming Agents for Amelioration of Abiotic Stresses in Crops

By Zahoor Ahmad, Ejaz Ahmad Waraich, Muhammad Aamir

Chapter 8 | 13 pages

Effective Use of Nanomaterials to Maintain Soil Fertility and Reduce Heavy Metal Toxicity in Soil

By Biswajit Pramanick, Anurag Bera, Priyanka Saha, Anamika Barman, Shiv Vendra Singh, Rishav Kumar, Sagar Maitra, Akbar Hossain

Abstract 

Chapter 9 | 14 pages

Alleviation of Heavy Metal Stress Through the Use of Nanotechnology

By Subhadip Saha, Madhurima Dey, Swapnadip Bose, Ratneswar Poddar, Prasanta Kumar Bandyopadhyay

Abstract 

Chapter 10 | 22 pages

Green Synthesis of Nanoparticles

Applications and Feasibility Over Chemical Synthesis Procedures

By Anu Kalia, Rajeev K. Gupta

Abstract 

Chapter 11 | 17 pages

Application of Nanotechnology in Rice

By Sanjoy K Debsharma, H. Khatun, M. Khatun, AKM Shalahuddin, MA Rahman, T. Halder, Popy R Roy, N. Akter, MA Syed

Abstract 

Chapter 12 | 21 pages

Prospects and Challenges of Nanofilms-based Edible Food Coatings for Enhancement of Their Shelf Life

By Richa Prasad Mahato, Pallavi Singh, Suchi Srivastava

Abstract ▾

Chapter 13 | 20 pages

Nanofilms for Enhancing the Shelf-life of Harvested Products

By G.A.H. Galahitigama, Isuri Thakshila, Salinda Sandamal, P.W.M. Tharindi, T. Suthajini, N.P.M. Abeysinghe, Asanka Tennakoon, Ayman El Sabagh, Disna Ratnasekera

Abstract ▾

Chapter 14 | 19 pages

Exploiting the Bioprospecting Potential of Nanoparticles with Micro-organisms

By Manaal Zahera, Katyayani Mishra, Faria Fatima

Abstract ▾

Chapter 15 | 13 pages

Applications of Nanoparticles as Anti-microbial Agents

By Aryadeep Roychoudhury, Ankur Singh

Abstract ▾

Chapter 16 | 22 pages

Nanotechnology

An Exciting Perspective for Nematode Management

14 Exploiting the Bioprospecting Potential of Nanoparticles with Micro-organisms

Manaal Zahera, Katyayani Mishra and Faria Fatima

14.1 INTRODUCTION

Nanotechnology is emerging as a cutting-edge technology involving a wide range of academic disciplines including physics, material science, chemistry, biology and medicine (Castillo-Henriquez et al., 2020). The prefix “nano” in the term nanotechnology is derived from a Greek word nano, which means “dwarf”. It refers to any engineered matter that is one billionth (10^{-9} m) in size or at least one of its dimensions. Nanoparticles are naturally formed and present in the environment as a result of processes such as mineralization, natural disasters and geological recycling of matter. As a result, numerous studies have been conducted to investigate the mode of action of nanoparticles on living organisms and their surroundings (Rawat et al., 2021). Because of the ease with which they can be produced in various shapes, nanoparticles are intriguing nanoscale systems (Singhal et al., 2012; Kolahalam et al., 2019). According to their nanoscale sizes, they exhibit a high surface-to-volume ratio, distinctive shapes and dimensions that are close to those of biomolecules, giving them special features for biological applications. The limitations of the chemical and physical approaches for creating nanoparticles can be solved by applying biological technique (X. F. Zhang et al., 2016). Additionally, using micro-organisms in the biogenic synthesis process has provided a trustworthy, long-lasting, secure and environmentally beneficial method for nano-synthesis. It is well-known that bacterial, algal, fungal and yeast cells can take metals from their surroundings and transform them into elemental nanoparticle forms that can then be collected or released. Viral technology has also been used to create strong nanocarriers (Ghosh et al., 2021). Capping agents are frequently released during biosynthesis to inhibit aggregation and encourage stability of the nanoparticles (Javed et al., 2020). Biogenic synthesis of NPs using microbes is a recent trend and a greener approach than physical and chemical methods of synthesis, which require higher costs, more energy consumption and complex reaction conditions with potentially hazardous environmental consequences (Khan et al., 2019). Several micro-organisms have been observed