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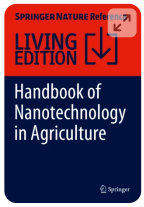

Handbook of Nanotechnology in Agriculture

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Overview

Editors: Azamal Husen

Provides a comprehensive review of the rapidly expanding discipline of nanotechnology in agricultural sectors
Includes in-depth discussions, a vast array of special topics and explore wide range applications
Represents an indispensable reference for nano-based professionals, academic researchers, and upper level of students

About this book

This handbook provides a comprehensive overview of the application of nanotechnology in agricultural sectors to boost sustainable agriculture with the use of these modern age nanomaterials and nanodevices that are empowering to attain maximum output from limited resources. The application of nanotechnology includes, enhancing plant growth and protection through the use of nanoparticles, the management of plant diseases and pest management through nano herbicides nanofungicides, nano/smart fertilizers for controlled and target release of nutrients, food processing and preservation with polymers nanocomposites. Further, in agriculture sectors nanosensors seem to be a promising tool for detection of fertilizers, herbicides, pesticides, and insecticides as well as pathogens, moisture, soil pH, soil contaminants, contaminants, and other parameters to improve crop health and sustainability. Moreover, nanosensors have also a significant role in precision agriculture activity, satellite farming or site-specific crop plants management in terms of detecting, calculating, and responding to inter and intra-field variability of crop plants. This handbook summarizes the recent findings, in-depth discussions and a wide range applications associated with smart nano research and technology for overall agricultural sectors and represents an indispensable reference for nano-based professionals, academic researchers, and upper level of students.

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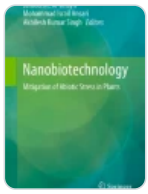

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Professor **Azamal Husen** research and teaching experience of 25 years encompasses nanobiotechnology, plant physiology, environmental botany, medicinal plants and plant propagation. He has contributed to R&D projects of the World Bank, the National Agricultural Technology Project, the Indian Council of Agriculture Research, the Indian Council of Forest Research Education, the Japan Bank for International Cooperation, and so on. Husen has published extensively (>300) and served on the Editorial Board, worked as Special Issue Guest Editor and reviewer of reputed journals published by Elsevier, Frontiers Media, Taylor & Francis, Springer Nature, RSC, Oxford University Press, Sciendo, the Royal Society, CSIRO, PLOS, MDPI, John Wiley & Sons, and UPM Journals. He is on the advisory board of Cambridge Scholars Publishing, UK. He is a fellow of the Plantae group of the American Society of Plant Biologists, and a member of the International Society of Root Research, Asian Council of Science Editors, and International Natural Product Sciences. He has given numerous talks and presentations in many conferences and workshops. Prof. Husen has also given various orientation courses for academic staff, prepared different modules, developed BSc, MSc and PhD curriculum. Moreover, he has received a recognition award from University of Gondar, Ethiopia for a decade of service in teaching, research and community services.

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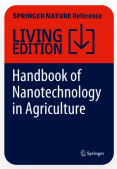

Handbook of Nanotechnology in Agriculture

Reena Vishvakarma, Mohammad Areeb Siddiqui, Nida Ansari, Pooja Kumari, Fiza Batool, Zoha Parvez & Archana Vimal

Abstract

The ongoing global environmental crisis has adversely affected agricultural productivity and, in the process, threatened food security. To boost agricultural production and enhance crop yield, the use of pesticides and fertilizers has led to the accumulation of toxins and heavy metals, further exacerbating the issue. Conventional methods of monitoring and quantifying the contaminants and toxins, like gas chromatography, mass spectrometry, and high-performance liquid chromatography, have proved to be effective but are at a disadvantage owing to limitations such as the need for skilled personnel, costly and sophisticated instruments, and complexity in use. With the advent of nanotechnology, a suitable alternative to these conventional methods has emerged as nanobiosensors or nanosensors, which are simple, cost-effective, and rapid in real-time analysis of soil temperature, moisture, pH, detection of contaminants, pesticides, and microorganisms in soil. Transitioning from laboratory study to commercial utility of nanosensors is tedious, but its successful application in agriculture commercially will ensure enhanced agricultural productivity while promoting sustainability.