

Preface

The world population is increasing at an alarming rate. While it has already crossed the seven billion line, it is expected to continue rising in the near future. To feed the teeming humanity in the new millennium, a huge responsibility lies on the shoulders of plant scientists to discover newer ways of enhancing crop production. Along with the inputs from classical breeding, molecular breeding, and biotechnology sciences, will nanotechnology also help in this venture? Will the birth of so-called ‘Nanobiotechnology’ science prove a boon? Nanotechnology in a naïve sense may appear as a paradigm of the physical sciences. This is however an understatement of the potential of nanotechnology. As it turns now, the advanced and modern nanotechnology science is equally relevant to life sciences and may play a major role in improving the quality of human life in the future years. Based on nanotechnology principles, novel inventions are being made everyday in the field of medicine. Nanoparticles are receiving much attention because of their unique physicochemical properties. The nanoparticles are thus being employed as “smart” delivery systems in life sciences. No wonder, the Noble laureate in Physiology Paul Ehrlich referred these compounds as “magic bullets”. In agriculture, nanoparticles are proving important as compound fertilizers and nanopesticides. Most excitingly, it is shown in recent years that nanoparticles may act as chemical delivery agents for targeting molecules such as genes/DNA to specific cellular organelles like nuclei in plants.

Considering that gaining a deeper understanding of the role of nanotechnology in relation to plant systems is of paramount importance, we felt that a dedicated book on bringing together varied aspects of plant and nanotechnology is the need of the hour. Our book *Nanotechnology and Plant Sciences: Nanoparticles and Their Impact on Plants* presents a holistic view of the use of nanoparticles in complex and dynamic aspects of plant research. The inclusion of nanoparticles in commercial products and industrial applications has significantly increased. To further extend these commercial gains, it is important to understand the interaction mechanisms between the nanoparticles and biological systems at the molecular level. The latter aspect has been emphasized in this book. As a new emerging field, nanobiotechnology unlocks new frontiers in genetic engineering science. However,

the information available on the use of nanoparticles in genetic transformation of plants is still scarce. We have tried to bring together the views of experts of these subjects under one platform of this book to address the above issues.

This book has 14 chapters written by experts with considerable experience in the area of research. The contents of each chapter are based on the research findings of active workers in nanotechnology. The book covers various important topics related to nanoparticles and plants. It provides an understanding of the mechanisms involved in the response of plants to nanoparticles. We firmly hope that the readers of this book will be exposed to new challenges and at the same time new vistas of future line of action in the area of plants and nanotechnology. We believe that students and researchers of plant molecular biology, plant physiology, agriculture, botany, biochemistry, biotechnology, environmental biology, microbiology, and forestry will be hugely benefitted by the contents of this book. We also hope that NGOs dealing with civic problems caused by rapid environmental degradation will find this book useful. The book will lead to a better understanding of the interdisciplinary field of functional biology and nanoparticles. The aim of writing this book was to bring together all possible approaches to tackle the aim of the improvement of current crops and introducing crop plants into areas not currently being used for cultivation. We have tried our best to realize these goals in bringing out this book and now we want the readers to evaluate how far we have been successful in this aim.

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Nanotechnology and Plant Sciences

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