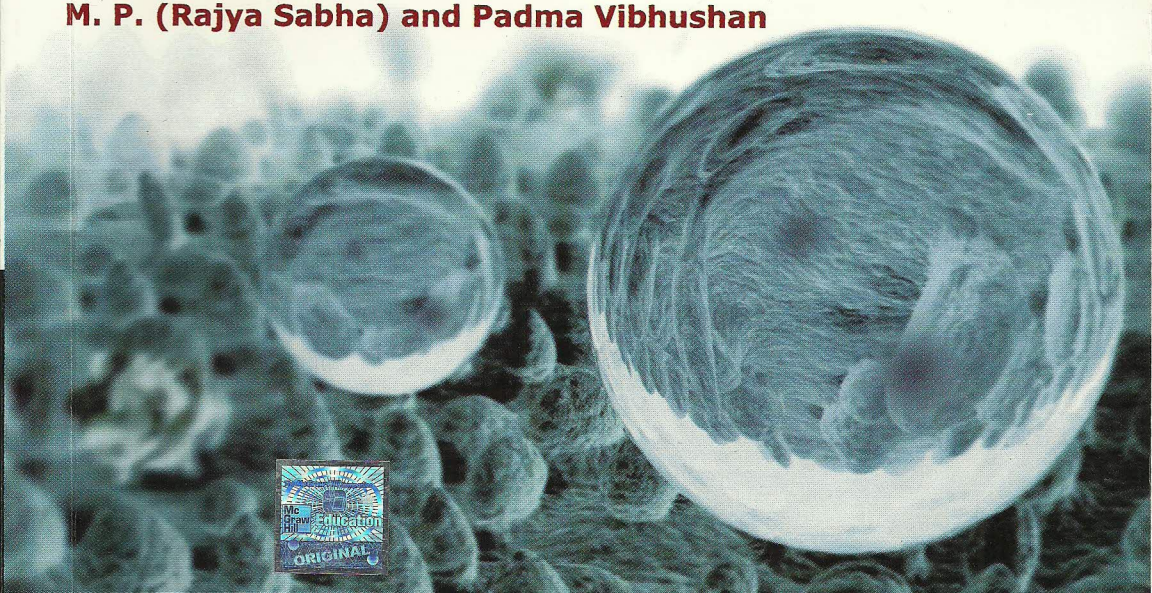
Biotechnology For Sustainable Development

Achievements and Challenges

A Commemoration Volume on the Occasion of the 75th Birth Anniversary of Prof. A. B. Prasad

With foreword by
Professor M. S. Swaminathan,
M. P. (Rajya Sabha) and Padma Vibhushan



Editors

Seyed E Hasnain • Rashmi Bhavanath Jha • R N Sharan

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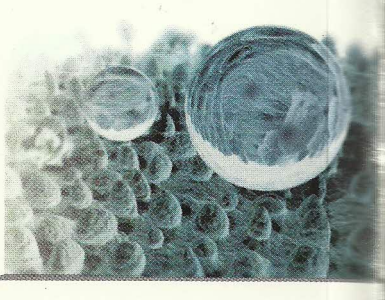

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BIOTECHNOLOGY FOR SUSTAINABLE DEVELOPMENT

Achievements and Challenges

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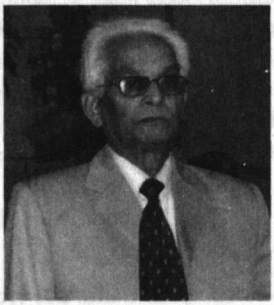

To commemorate the 75th birth anniversary of

Professor Akhouri Balram Prasad

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Who has been
a wonderful father and counselor,
a great teacher and mentor,
an eminent scholar and researcher,
a memorable friend and colleague,
and above all,
a human being *par excellence.*

FOREWORD

Biotechnology offers uncommon opportunities to convert bioresources into jobs and income. For taking advantage of such opportunities, it is important to link biodiversity, biotechnology and business in a mutually reinforcing manner. This can be achieved through the organization of biovillages, which will help to launch an era of biohappiness arising from the conservation, sustainable use and equitable sharing of benefits on biodiversity. This is why the book, "**Biotechnology for Sustainable Development: Achievements and Challenges**" is a timely and important publication. It is appropriate that the book is dedicated to **Prof. A. B. Prasad**, whose contributions to science and society are truly monumental.

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PREFACE

Biotechnology from curd production to animal cloning has proven its potential and attracted scientists to utilize its intrinsic value. The potential applications of this very powerful tool available to mankind include providing affordable food, combating new and emerging infectious diseases and cost effective medicines, alternative non-fossil fuel energy sources, neutralizing the effects of climate change, environmental disasters such as the oil spills and volcanic ash eruption, and many more. Clearly, the usage of biotechnology is numerous and so are the challenges. This volume "Biotechnology for Sustainable Development: Achievements and Challenges" represents a small collective effort to update on achievements in Biotechnology in the broad areas of food security, cleaner environment and human health and, at the same time, emphasize upon the unmet needs. The book has two sections: applications (Chapters 1–8) and challenges (Chapters 9–16). The first Chapter deals with food security and gives an elegant picture of overall success of "Green revolution" of 1960s and the impending need for "Evergreen Revolution". Salinity is major cause of crop loss and yield reduction world over. Genetic engineering of salt stress tolerance using specific gene(s) or regulatory protein is one of the important research areas in the present time, role of different types of genes and there response after transformation is also included. The application of microbes, from cynaobacteria to nitrogen fixing bacteria, and plant growth promoting rhizobacteria and their applications have been discussed in three Chapters. The Biotechnological intervention for rural development has been also highlighted. A Chapter on the orchids, the most beautiful ornamental plants with useful medicinal properties, is added. One of the Chapters deals with the usage of soil minerals instead of chemical fertilizer for sustainable agriculture. This Chapter has emphasized the application of an organic carbon source to the soil at regular intervals to increase the availability of mineral nutrients to plants, without applying chemical fertilizers. Jatropha biodiesel can be a sustainable biofuel with the current carbon credit stipulations and its genetic resources are highly important for improving further oil yielding cultivars. A Chapter dedicated to genomics of jatropha is included. Plant nematodes cause serious devastation to crop plants. Several biotechnological approaches for developing crop plants with improved resistance against plant parasitic nematodes, including cloning and transferring of nematode resistance genes into nematode susceptible crop plants, inactivation of essential nematode gene products (i.e. parasitic genes) through RNAi technology and protease inhibitors as anti-nematode effectors are mentioned. India is emerging as a global hub of the dreaded disease tuberculosis (TB), which globally takes one human life every 15 seconds, and the serious implications on the clinical

management of TB, when accompanied with HIV-AIDS, have been discussed in another Chapter. Genomics and proteomics hold great promises in cancer therapy and other degenerative disorders besides their application as a radiation-counter measure. A Chapter highlights both the promises and challenges that lie ahead in this arena. Despite being relatively young, nano technology holds great promises in medicine as well as in other arenas including rural development. Application of any technology poses several ethical, moral, social and legal issues. The last Chapter touches upon some of these aspects to provide the finishing touch to the volume. In nutshell, we have made a serious effort to make this volume a comprehensive treatise of Biotechnology in different areas for sustainable development. This volume is very likely to fill the existing void and provide the required resource material to students, teachers and researchers as well as to policy makers.

The Editors acknowledge the inspiration that came from Prof. Akhouri Balram Prasad, a heptogenerian Cytogeneticist, who has been the main driving force behind this effort. We are extremely grateful to all contributors, who are experts in their respective fields, for their valuable contributions. We greatly appreciate their cooperation and understanding. The publishers, McGraw Hill Education, and their staff, especially Ms. Smruti Snigdha, have been very cooperative in their approach to bring out this volume. But for their professional help and cooperation, it would have been difficult to meet the target dates.

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