

Medicinal Plant Biotechnology

Transgenic Technology Based Value Addition in Plant Biotechnology discusses the principles, methodology and applications of transgenic technologies. With step-by-step methods on genome editing techniques and a range of potential applications, from improving crop yield to increasing therapeutic efficacy, this book is a one-stop reference for plant gene editing technologies. It will be of particular interest to researchers interested in plant biotechnology and plant genetics, as well as agricultural scientists and those concerned with medicinal plants. Includes step-by-step methods to assist students and researchers with genome editing and bioinformatics tools Highlights a number of applications of plant biotechnology, including how to achieve desired traits, such as improved crop yield Discusses principles, methodology and applications of transgenic technologies

Before the concept of history began, humans undoubtedly acquired life benefits by discovering medicinal and aromatic plants (MAPs) that were food and medicine. Today, a variety of available herbs and spices are used and enjoyed throughout the world and continue to promote good health. The international market is also quite welcoming for MAPs and essential oils. The increasing environment and nature conscious buyers encourage producers to produce high quality essential oils. These consumer choices lead to growing preference for organic and herbal based products in the world market. As the benefits of medicinal and aromatic plants are recognized, these plants will have a special role for humans in the future. Until last century, the production of botanicals relies to a large degree on wild-collection. However, the increasing commercial collection, largely unmonitored trade, and habitat loss lead to an incomparably growing pressure on plant populations in the wild. Therefore, medicinal and aromatic plants are of high priority for conservation. Given the above, we bring forth a comprehensive volume, "Medicinal and Aromatic Plants: Healthcare and Industrial Applications," highlighting the various healthcare, industrial and pharmaceutical applications that are being used on these immensely important MAPs and its future prospects. This collection of chapters from the different areas dealing with MAPs caters to the need of all those who are working or have interest in the above topic.

The book provides an overview of current trends in biotechnology and medicinal plant sciences. The work includes detailed chapters on various advance biotechnological tools involved in production of phytoactive compounds of medicinal significance. Some recent and novel research studies on therapeutic applications of different medicinal plants from various geographical regions of the world have also been included. These studies report the antimicrobial activity of various natural plant products against various pathogenic microbial strains. Informative chapters on recent emerging applications of plant products such as source for nutraceuticals and vaccines have been integrated to cover latest advances in the field. This book also explores the conservation aspect of medicinal plants. Thus, chapters having comprehensively compiled in vitro conservation protocols for various commercially important rare, threatened and endangered medicinal plants were provided in the present book.

It enhance the understanding of fundamentals in the field of the plant tissue culture. It enables its readers to get acquainted with the applications of the tissue culture technique to conserve the endangered medicinally important plants. In the present book the

tissue culture of the two medicinally important plants such as *Geranium* sp. and *Cholorophytum* sp. were studied. The in-vitro raised platelets were successfully transferred to field.

Medicinal Plants Biotechnology considers various aspects of Medicinal Plants Biotechnology including an extensive historical overview of Medicinal Plants Biotechnology and related issues. It includes definitions of Medicinal plant biotechnology: trends and challenges, Biotechnological techniques for in vitro regeneration of medicinal plants, Genetic transformation of medicinal plants: direct gene transfer, Elicitation: An efficient tool for in vitro secondary metabolite production. Provides the reader with insights into the development of its history, so as to understand Biotechnological production of *Hypericum perforatum* hyperforins and hypericins and *Catharanthus roseus* alkaloids.

Growing consumer interest in organic and herbal-based products has led to great demand in the botanicals industry in the past few years. However, the growing number of products utilizing medicinal and aromatic plants (MAPs) has threatened an estimated 9,000 medicinal plant species worldwide, making it critical to reevaluate their research and development, production, and utilization. Continuing advances in Omics methodologies and instrumentation are essential to understanding how plants cope with the dynamic nature of their growing environment, how yields and characteristics can be improved, and how to most effectively direct conservation efforts. With a focus on metabolomics, genomics, proteomics, transcriptomics, and more, *Medicinal and Aromatic Plants: Expanding Their Horizons through Omics* illustrates the genetic mechanisms of MAPs, providing a better understanding of MAPs conservation and methods to improve characteristics for medical applications. With an introduction on the role of MAPs in human health, subsequent chapters discuss using proteomics to increase MAP yields and plant quality, genome editing, and CRISPR/Cas9. A valuable resource for farmers, scientists, chemists, biochemists, pharmacists, and students interested in medicinal and aromatic plants and plant biology, *Medicinal and Aromatic Plants: Expanding Their Horizons through Omics* ensures readers have the background knowledge to put the necessary methodologies into practice themselves. Includes in-depth analysis of Omics technologies for the enhancement of MAPs Discusses applications of MAPs including their role in human health Written by world-wide leading experts in the field

Comprising 26 chapters, this volume deals with the genetic transformation of medicinal plants. It describes methods to obtain plants resistant to insects, diseases, herbicides, and plants with an increased production of compounds of medicinal and pharmaceutical importance. The plant species included are *Ajuga reptans*, *Anthemis nobilis*, *Astragalus* spp., *Atropa belladonna*, *Catharanthus roseus*, *Datura* spp., *Duboisia leichhardtii*, *Fagopyrum* spp., *Glycyrrhiza uralensis*, *Lobelia* spp., *Papaver somniferum*, *Panax ginseng*, *Peganum hamala*, *Perezia* spp., *Pimpinella anisum*, *Phyllanthus niruri*, *Salvia miltiorrhiza*, *Scoparia dulcis*, *Scutellaria baicalensis*, *Serratula tinctoria*, *Solanum aculeatissimum*, *Solanum commersonii*, *Swainsona galegifolia*, tobacco, and *Vinca minor*. The book is of special interest to advanced students, teachers, and researchers in the fields of pharmacy, plant tissue culture, phytochemistry, molecular biology, biomedical engineering, and plant biotechnology in general.

Modern Applications of Plant Biotechnology in Pharmaceutical Sciences explores advanced techniques in plant biotechnology, their

applications to pharmaceutical sciences, and how these methods can lead to more effective, safe, and affordable drugs. The book covers modern approaches in a practical, step-by-step manner, and includes illustrations, examples, and case studies to enhance understanding. Key topics include plant-made pharmaceuticals, classical and non-classical techniques for secondary metabolite production in plant cell culture and their relevance to pharmaceutical science, edible vaccines, novel delivery systems for plant-based products, international industry regulatory guidelines, and more. Readers will find the book to be a comprehensive and valuable resource for the study of modern plant biotechnology approaches and their pharmaceutical applications. Builds upon the basic concepts of cell and plant tissue culture and recombinant DNA technology to better illustrate the modern and potential applications of plant biotechnology to the pharmaceutical sciences Provides detailed yet practical coverage of complex techniques, such as micropropagation, gene transfer, and biosynthesis Examines critical issues of international importance and offers real-life examples and potential solutions

Covers the structurally diverse secondary metabolites of medicinal plants, including their ethnopharmacological properties, biological activity, and production strategies Secondary metabolites of plants are a treasure trove of novel compounds with potential pharmaceutical applications. Consequently, the nature of these metabolites as well as strategies for the targeted expression and/or purification is of high interest. Regarding their biological and pharmacological activity and ethnopharmacological properties, this book offers a comprehensive treatment of 100 plant species, including Abutilon, Aloe, Cannabis, Capsicum, Jasminum, Malva, Phyllanthus, Stellaria, Thymus, Vitis, Zingiber, and more. It also discusses the cell culture conditions and various strategies used for enhancing the production of targeted metabolites in plant cell cultures. Secondary Metabolites of Medicinal Plants: Ethnopharmacological Properties, Biological Activity and Production Strategies is presented in four parts. Part I provides a complete introduction to the subject. Part II looks at the ethnomedicinal and pharmacological properties, chemical structures, and culture conditions of secondary metabolites. The third part examines the many strategies of secondary metabolites production, including: biotransformation; culture conditions; feeding of precursors; genetic transformation; immobilization; and oxygenation. The last section concludes with an overview of everything learned. -Provides information on cell culture conditions and targeted extraction of secondary metabolites confirmed by relevant literature -Presents the structures of secondary metabolites of 100 plant species together with their biological and pharmacological activity -Discusses plant species regarding their distribution, habitat, and ethnopharmacological properties -Presents strategies of secondary metabolites production, such as organ culture, pH, elicitation, hairy root cultures, light, and mutagenesis Secondary Metabolites of Medicinal Plants is an important book for students, professionals, and biotechnologists interested in the biological and pharmacological activity and ethnopharmacological properties of plants.

Medicinal Plant BiotechnologyCABI

This book is a unique overview of insights on the genetic basis of anti-diabetic activity, chemistry, physiology, biotechnology, mode-of-action, as well as cellular mechanisms of anti-diabetic secondary metabolites from medicinal plants. The World Health Organization estimated that 80% of the populations of developing countries rely on traditional medicines, mostly plant drugs, for their primary health care needs. There is an increasing demand for medicinal plants having anti-diabetic potential in both developing and developed countries. The expanding trade in medicinal plants has serious implications on the survival of several plant species, with many under threat to become extinct. This book describes various approaches to conserve these genetic resources. It discusses the whole spectrum of biotechnological tools from micro-propagation for large-scale multiplication, cell-culture techniques to the biosynthesis and enhancement of pharmaceutical compounds in the plants. It also discusses the genetic transformation as well as short- to long-term conservation of plant genetic resources via synthetic seed

production and cryopreservation, respectively. The book is enriched with expert contributions from across the globe. This reference book is useful for researchers in the pharmaceutical and biotechnological industries, medicinal chemists, biochemists, botanists, molecular biologists, academicians, students as well as diabetic patients, traditional medicine practitioners, scientists in medicinal and aromatic plants, Ayurveda, Siddha, Unani and other traditional medical practitioners.

Medicinal Plants: Chemistry, Biology and Omics reviews the phytochemistry, chemotaxonomy, molecular biology, and phylogeny of selected medicinal plant tribes and genera, and their relevance to drug efficacy. Medicinal plants provide a myriad of pharmaceutically active components, which have been commonly used in traditional Chinese medicine and worldwide for thousands of years. Increasing interest in plant-based medicinal resources has led to additional discoveries of many novel compounds, in various angiosperm and gymnosperm species, and investigations on their chemotaxonomy, molecular phylogeny and pharmacology. Chapters in this book explore the interrelationship within traditional Chinese medicinal plant groups and between Chinese species and species outside of China. Chapters also discuss the incongruence between chemotaxonomy and molecular phylogeny, concluding with chapters on systems biology and “-omics technologies (genomics, transcriptomics, proteomics, and metabolomics), and how they will play an increasingly important role in future pharmaceutical research. Reviews best practice and essential developments in medicinal plant chemistry and biology Discusses the principles and applications of various techniques used to discover medicinal compounds Explores the analysis and classification of novel plant-based medicinal compounds Includes case studies on pharmaphylogeny Compares and integrates traditional knowledge and current perception of worldwide medicinal plants

This book on medicinal plant biotechnology covers recent developments in this field. It includes a comprehensive up-to-date survey on established medicinal plants and on molecules which gained importance in recent years. No recently published book has covered these carefully selected topics. The contributing scientists have been selected on the basis of their involvement in the related plant material as evident by their internationally recognised published work.

Since ancient times, plants have been used as a prime natural source of alternative medicines and have played an important role in our lives. The old tradition of medicinal plant application has turned into a highly profitable business in the global market, resulting in the release of a large number of herbal products. People have tried to find different sources of medicines to alleviate pain and cure different illnesses. Due to severe constraints of synthetic drugs and the increasing contraindications of their usage, there is a growing interest world over in the usage of natural products based on medicinal herbs, hence, there is an ever expanding market of herbs and herbal based medicinal preparations all over the world. This has culminated into an exponential increase in number of research groups in different geographical locations and generation of volume of research data in the field in a short span of time. The path breaking advancement in research methods and interdisciplinary approaches is giving birth to newer perspectives. Therefore, it becomes imperative to keep pace with the advancement in research and development in the field of medicinal herbs. There are a large number of researchers in different parts of the world working on various aspects of medicinal plants and ‘herbal medicines’. The idea is to bring their recent research work into light in the form of a book. The proposed book contains chapters by the eminent researchers in different countries and working with different disciplines of medicinal plants. Articles pertain to different disciplines such as: 1. Resources and conservation of medicinal plants 2. Biosynthesis and metabolic engineering of medicinal plants 3. Tissue culture, propagation and bioreactor technology of medicinal plants 4. Phytochemical research on medicinal plants 5. Herbal medicines and plant-derived agents in cancer prevention and therapy 6. Herbal medicines and plant-derived

agents in metabolic syndrome management 7. Herbal medicines and plant-derived agents in modulation of immune-related disorders 8. Herbal medicines and hepatotoxicity The book will prove itself an asset for the researchers, professionals and also students in the area of medicinal plants and mechanism of their action.

Plant-based medicines play an important role in all cultures, and have been indispensable in maintaining health and combating diseases. The identification of active principles and their molecular targets from traditional medicine provides an enormous opportunity for drug development. Using modern biotechnology, plants with specific chemical compositions can be mass propagated and genetically improved for the extraction of bulk active pharmaceuticals. Although there has been significant progress in the use of biotechnology, using tissue cultures and genetic transformation to investigate and alter pathways for the biosynthesis of target metabolites, there are many challenges involved in bringing plants from the laboratory to successful commercial cultivation. This book presents the latest advances in the development of medicinal drugs, including topics such as plant tissue cultures, secondary metabolite production, metabolomics, metabolic engineering, bioinformatics and future biotechnological directions.

Covering the latest advances in the use of plants to produce medicinal drugs and vaccines, examines topics including plant tissue culture, secondary metabolite production, metabolomics and metabolic engineering, bioinformatics, molecular farming and future biotechnological directions.

The demand for medicinal plants is increasing, and this leads to unscrupulous collection from the wild and adulteration of supplies. Providing high-quality planting material for sustainable use and thereby saving the genetic diversity of plants in the wild is important. In this regard, the methods of propagation of some important medicinal plants are provided along with the traditional methods of propagation. Indian Medicinal Plants: Uses and Propagation Aspects offers a unique compendium of more than 270 medicinal plant species from India with detailed taxonomic classifications based on the Bentham and Hooker system of classification. Salient Features: Provides traditional methods of propagation and discusses the propagation of medicinal plants Presents plant properties, plant parts and chemical constituents Describes the medicinal uses of more than 270 medicinal plant species from India This book is of special interest to practitioners of alternative medicine, students of Ayurveda, researchers and industrialists associated with medical botany, pharmacologists, sociologists and medical herbalists.

Plant biochemistry is the study of the chemistry of plants. Plant biochemists study the structure and function of cellular components and chemical reactions that taking place in plants. The tools and techniques of new biology have opened several new and exciting avenues in plant biochemistry. However, these have not been sufficiently tapped by plant scientists, in their rush for cloning, sequencing, tissue culture and transformation. Biochemistry is the study of chemical reactions taking place in living organisms, notably reactions of degradation of food substances which provide the energy required by organisms, and transformation of biosynthesis reactions leading to the formation of compounds needed by the cells. Medicinal plants are nature's hidden and to a large extent unexplored treasure. India is endowed with about 8000 species of medicinal plants. According to a

recent estimate of the Planning Commission, Government of India, the potential for plant-based crude drugs is about Rs. 400 billion. Globally, the demand for medicinal plants and their derivatives is growing at a rate of 7-15%. This book provides students and researchers in the plant sciences with a concise, up-to-date account of the bio-chemical basis of the major metabolic processes in plants. This is a comprehensive, exclusive and exhaustive work on the subject. It is an asset for all researchers and scholars.

For the majority of the world's population, medicinal and aromatic plants are the most important source of life-saving drugs. Biotechnological tools represent important resources for selecting, multiplying and conserving the critical genotypes of medicinal plants. In this regard, in-vitro regeneration holds tremendous potential for the production of high-quality plant-based medicines, while cryopreservation – a long-term conservation method using liquid nitrogen – provides an opportunity to conserve endangered medicinal and aromatic plants. In-vitro production of secondary metabolites in plant cell suspension cultures has been reported for various medicinal plants, and bioreactors represent a key step toward the commercial production of secondary metabolites by means of plant biotechnology. Addressing these key aspects, the book contains 29 chapters, divided into three sections. Section 1: In-vitro production of secondary metabolites Section 2: In-vitro propagation, genetic transformation and germplasm conservation Section 3: Conventional and molecular approaches

Ethnopharmacology and Biodiversity of Medicinal Plants provides a multitude of contemporary views on the diversity of medicinal plants, discussing both their traditional uses and therapeutic claims. This book emphasizes the importance of cataloging ethnomedical information as well as examining and preserving the diversity of traditional medicines. It also discusses the challenges present with limited access to modern medicine and the ways in which research can be conducted to enhance these modern practices. The book also explores the conservation procedures for endangered plant species and discusses their relevance to ethnopharmacology. Each chapter of this book relays the research of experts in the field who conducted research in diverse landscapes of India, providing a detailed account of the basic and applied approaches of ethnobotany and ethnopharmacology. The book reviews multiple processes pertaining to medicinal plants, such as collecting the traditional therapeutic values and validation methods. It also explores developments in the field such as the diversity and medicinal potential of unexplored plant species and applications in drug formulation to fight against anti-microbial resistance (AMR).

Industrial Biotechnology summarizes different aspects of plant biotechnology such as using plants as sustainable resources, phytomedical applications, phytoremediation and genetic engineering of plant systems. These topics are discussed from an academic as well industrial perspective and thus highlight recent developments but also practical aspects of modern biotechnology.

27 chapter cover the distribution, economic importance, conventional propagation, micropropagation, tissue culture, and in vitro production of important medicinal and pharmaceutical compounds in various species of *Ajuga*, *Allium*, *Ambrosia*, *Artemisia*, *Aspilia*, *Atractylodes*, *Callitris*, *Choisya*, *Cinnamomum*, *Coluria*, *Cucumis*, *Drosera*, *Daucus*, *Eustoma*, *Fagopyrum*, *Hibiscus*,

Levisticum, Onobrychis, Orthosiphon, Quercus, Sanguinaria, Solanum, Sophora, Stauntonia, Tanacetum, Vetiveria, and Vitis. Like the previous volumes 4, 7, 15, and 21 in the Medicinal and Aromatic Plants series, the volume is tailored to the need of advanced students, teachers, and research scientists in the area of plant biotechnology and bioengineering, pharmacy, botany and biochemistry.

Very important book, as far as biotechnology inventions are concerned

Considering the ever-increasing global population and finite arable land, technology and sustainable agricultural practices are required to improve crop yield. This book examines the interaction between plants and microbes and considers the use of advanced techniques such as genetic engineering, revolutionary gene editing technologies, and their applications to understand how plants and microbes help or harm each other at the molecular level. Understanding plant-microbe interactions and related gene editing technologies will provide new possibilities for sustainable agriculture. The book will be extremely useful for researchers working in the fields of plant science, molecular plant biology, plant-microbe interactions, plant engineering technology, agricultural microbiology, and related fields. It will be useful for upper-level students and instructors specifically in the field of biotechnology, microbiology, biochemistry, and agricultural science. Features: Examines the most advanced approaches for genetic engineering of agriculture (CRISPR, TALAN, ZFN, etc.). Discusses the microbiological control of various plant diseases. Explores future perspectives for research in microbiological plant science. Plant-Microbial Interactions and Smart Agricultural Biotechnology will serve as a useful source of cutting-edge information for researchers and innovative professionals, as well as upper-level undergraduate and graduate students taking related agriculture and environmental science courses. This unique overview of plants and transgenic techniques of great scientific, medicinal and economic value for both industry and academia covers the whole spectrum from cell culture techniques, via genetic engineering and secondary product metabolism right up to the use of transgenic plants for the production of bioactive compounds. Practical examples are given throughout, including the production of cancer therapeutics, functional food, and flavor compounds in plants. Of particular interest to the pharmaceutical and biotechnological industries, as well as medicinal chemists, biochemists, and molecular biologists.

Plant-based medicines assume a critical part in all societies, and have been fundamental in keeping up wellbeing and battling infections. The distinguishing proof of dynamic standards and their sub-atomic focuses from customary prescription gives a huge chance to sedate advancement. Utilizing present day biotechnology, plants with particular synthetic syntheses can be mass spread and hereditarily enhanced for the extraction of mass dynamic pharmaceuticals. In spite of the fact that there has been noteworthy advance in the utilization of biotechnology, utilizing tissue societies and hereditary change to research and modify pathways for the biosynthesis of target metabolites, there are many difficulties associated with bringing plants from the lab to effective plug development. This book shows the most recent advances in the improvement of restorative medications, including points, for example, plant tissue societies, optional metabolite generation, metabolomics, metabolic building, bioinformatics and future biotechnological bearings. This special review of plants and transgenic systems of extraordinary logical, therapeutic and

financial incentive for both industry and the scholarly community covers the entire range from cell culture methods, by means of hereditary designing and auxiliary item digestion up to the utilization of transgenic plants for the generation of bioactive mixes. 27 chapters cover the distribution, economic importance, conventional propagation, micropropagation, tissue culture studies, and in vitro production of important medicinal and other pharmaceutical compounds in various species of Anchusa, Brucea, Catharanthus, Chrysanthemum, Coleus, Corydalis, Coreopsis, Emilia, Ginkgo, Gloriosa, Hypericum, Inonotus, Leucosceptum, Liliium, Linum, Mosses, Nandina, Penstemon, Prunus, Pteridium, Quassia, Ribes, Senecio, Taraxacum, Thermopsis, Vanilla, and Vitiveria. Like the previous five volumes on medicinal and aromatic plants (Volumes 4, 7, 15, 21, and 24), this book contains a wealth of useful information for advanced students and researchers in the field of plant biotechnology and chemical engineering, pharmacy, botany and tissue culture.

This book starts with a general introduction to phytochemistry, followed by chapters on plant constituents, their origins and chemistry, but also discussing animal-, microorganism- and mineral-based drugs. Further chapters cover vitamins, food additives and excipients as well as xenobiotics and poisons. The book also explores the herbal approach to disease management and molecular pharmacognosy and introduces methods of qualitative and quantitative analysis of plant constituents. Phytochemicals are classified as primary (e.g. carbohydrates, lipids, amino acid derivations, etc.) or secondary (e.g. alkaloids, terpenes and terpenoids, phenolic compounds, glycosides, etc.) metabolites according to their metabolic route of origin, chemical structure and function. A wide variety of primary and secondary phytochemicals are present in medicinal plants, some of which are active phytomedicines and some of which are pharmaceutical excipients.

This book provides new information relating recent advances made in the field of plant secondary products. Besides the updation of chapters this edition also includes chapters on secondary metabolites of microorganisms (fungi and lichen).

Deserts appear very fascinating during our short visits. However, the lives of plants and animals are very difficult under the harsh climatic conditions of high temperature and scant water supply in deserts, sometimes associated with high concentrations of salt. The editor of this book was born and brought up in the Great Indian Desert, and has spent much of his life studying the growth and metabolism of desert plants. It is very charming on a cool summer evening to sit at the top of a sand dune listening only to blowing air and nothing else. It has been my dream to prepare a volume on desert plants encompassing various aspects of desert plant biology. In this book, I have tried to present functional and useful aspects of the vegetation resources of deserts along with scientific input aimed at understanding and improving the utility of these plants. The scant vegetation of deserts supports animal life and provides many useful medicines, timber and fuel wood for humans. Therefore, there are chapters devoted to medicinal plants (Chap. 1), halophytes (Chaps. 13, 14), and fruit plants (Chaps. 17, 20). Desert plants have a unique reproductive biology (Chaps. 9–11), well-adapted eco-physiological and anatomical characteristics (Chap. 7), and specialised metabolism and survival abilities. These plants are difficult to propagate and pose many problems to researchers developing biological approaches for their amelioration (Chaps. 18–20).

Plant biotechnology applies to three major areas of plants and their uses: (1) control of plant growth and development; (2) protection of plants against biotic and abiotic stresses; and (3) expansion of ways by which specialty foods, biochemicals, and pharmaceuticals are produced. The topic of recent advances in plant biotechnology is ripe for consideration because of the rapid developments in this field that have revolutionized our concepts of sustainable food production, cost-effective alternative energy strategies, environmental bioremediation, and production of plant-derived medicines through plant cell biotechnology. Many of the more traditional approaches to plant biotechnology are woefully out of date and even obsolete. Fresh approaches are therefore required. To this end, we have brought together a group of contributors who address the most recent advances in plant biotechnology and what they mean for human progress, and hopefully, a more sustainable future. Achievements today in plant biotechnology have already surpassed all previous expectations. These are based on promising accomplishments in the last several decades and the fact that plant biotechnology has emerged as an exciting area of research by creating unprecedented opportunities for the manipulation of biological systems. In connection with its recent advances, plant biotechnology now allows for the transfer of a greater variety of genetic information in a more precise, controlled manner. The potential for improving plant productivity and its proper use in agriculture relies largely on newly developed DNA biotechnology and molecular markers. The present book is divided into five sections. The first section deals with the methodology and bioresource generation, techniques related to genetic engineering, and gene transfer to the nuclear genome and chloroplast genome. The new techniques of genome profiling and gene silencing are also presented. The second section of the book deals with the classical aspect of plant biotechnology viz. tissue culture and micropropagation. Use of genetic engineering via *Agrobacterium* and direct transfer of DNA via particle bombardment to develop transformed plants in *Artemisia*, castor and orchids, and production of recombinant proteins in plant cells have been dealt with in the third section. The fourth section deals with the abiotic and biotic stress tolerance in plants. The basic biology of some of the stress responses, and designing plants for stress tolerance is discussed in this section. The fifth section deals with medicinal plants and alkaloid production.

Plant tissue culture and advanced biotechnologies have proven to be influential tools that complement conventional breeding and accelerate development of many medicinal plants. Various approaches, such as pathway engineering, precursor feeding, transformation, elicitation with biotic and abiotic elicitors and scaling up in bioreactors, have been explored to improve the production of secondary metabolites from different medicinal plants. This book provides a comprehensive description of various studies, carried out on in vitro culture and hairy root cultures of *Catharanthus roseus*, *Silybum marianum* and *Digitalis* species which have been considered as alternative sources for the production of anti-tumour compounds, flavonolignans and cardenolides. Specific focus is on elicitation strategy for increasing production of bioactive compounds of *C. roseus* L., *S. marianum* and *Digitalis* species to overcome the constraints of conventional propagation. This book is valuable for researchers or students working on medicinal plants, phytochemistry, and plant tissue culture. It also serves as a reference for the pharmaceutical industry.

Medicinal plant research is an evergreen subject. There is a tremendous increase in popularity of herbal medicine in traditional

medicine, ethnomedicine, modern medicine and as over the counter food supplements. Even after this increased demand, supply is neither uniform nor assured as most of these plants are collected from wild. In developing countries of tropical and subtropical regions where majority of herbal drugs are produced, this is not organised sector making it vulnerable to several malpractices, hence standardization of all aspects required. This has also negative impact on biodiversity and conservation of plants as well as supply of uniform material. This book is aimed to provide up to date information about sustainable use of selected medicinal plants, their active ingredients and efforts made to domesticate them to ensured uniform supply. Development of agrotechnology, biotechnology and cultivation practices using conventional and non-conventional methods are presented. Where these efforts will lead the medicinal plant research and future perspective are discussed. The chapters are written by well recognised group leaders in working in the field. The book contains topics on general biology of medicinal plants, their sustainable use and, cultivation and domestication efforts. A uniform chapter structure has been designed to keep consistency. The book will be useful for academicians, agriculturists, biotechnologists and researcher, and industries involved in manufacturing herbal drugs and supplementary products.

This book discusses cancers and the resurgence of public interest in plant-based and herbal drugs. It also describes ways of obtaining anti-cancer drugs from plants and improving their production using biotechnological techniques. It presents methods such as cell culture, shoot and root culture, hairy root culture, purification of plant raw materials, genetic engineering, optimization of culture conditions as well as metabolic engineering with examples of successes like taxol, shikonin, ingenol mebutate and podophylotoxin. In addition, it describes the applications and limitations of large-scale production of anti-cancer compounds using biotechnological means. Lastly, it discusses future economical and eco-friendly strategies for obtaining anti-cancer compounds using biotechnology.

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