Role Of Mutation In Crop Improvement

S.K Datta

Role of Mutation Breeding In Floriculture Industry S.K Datta,2023-10-31 This monograph provides a comprehensive review of many aspects of current interest and progress on mutation research on vegetatively propagated ornamentals. It covers almost all aspects of induced mutagenesis on ornamental plants. Chapters in this title provides information about mutation technology for the development of new ornamental varieties. Taking all aspects together, it is an excellent reference book of updated information on mutation breeding on vegetatively propagated ornamentals. Floriculture has become a very important industry in many countries as a result of science-based techniques and a steady supply of improved plant materials. The induced mutation is now recognized as well as a standardized valuable tool for the development of new varieties. The book provides an authoritative review account of all important aspects related to inducing mutagenesis in the field of ornamental crops. The primary objective of the book is to give a coherent and concise account of earlier work with an emphasis on recent developments. The knowledge generated so far has been reviewed in this book which can work as a knowledge base to prepare guidelines for future planning of successful application of mutation technology for the floriculture industry. The information in the book is an excellent informative document for researchers, teachers, students, and breeders for understanding the application of induced mutations and planning future strategies for the development of new ornamental varieties for the floriculture industry.

Somaclonal Variation and Induced Mutations in Crop Improvement S.M. Jain,D.S. Brar,B.S. Ahloowalia,2013-03-14 Genetic variability is an important parameter for plant breeders in any con ventional crop improvement programme. Very often the desired variation is un available in the right combination, or simply does not exist at all. However, plant breeders have successfully recombined the desired genes from cultivated crop gerrnplasm and related wild species by sexual hybridization, and have been able to develop new cultivars with desirable agronomie traits, such as high yield, disease, pest, and drought resistance. So far, conventional breeding methods have managed to feed the world's ever-growing population. Continued population growth, no further scope of expanding arable land, soil degradation, environ mental pollution and global warrning are causes of concern to plant biologists and planners. Plant breeders are under continuous pressure to improve and develop new cultivars for sustainable food production. However, it takes several years to develop a new cultivar. Therefore, they have to look for new technologies, which could be combined with conventional

methods to create more genetic variability, and reduce the time in developing new cultivars, with early-maturity, and improved yield. The first report on induced mutation of a gene by HJ. Muller in 1927 was a major mi1estone in enhancing variation, and also indicated the potential applica tions of mutagenesis in plant improvement. Radiation sources, such as X-rays, gamma rays and fast neutrons, and chemical mutagens (e. g. , ethyl methane sulphonate) have been widely used to induce mutations.

Plant Mutagenesis and Crop Improvement Nitish Kumar,2024-02-23 Crop improvement using classically induced mutagenesis is now well standardized. Many new promising varieties of different crops have been successfully developed worldwide using both physical and chemical mutagens. Voluminous literature is now available on basic and applied aspects of mutagenesis. The mutation technique has been refined and holds the promise of generating much wider and more desirable variability than classical breeding. Recent advances in technology combined with classical mutation breeding offer new and exciting challenges for the development of new varieties. A global inventory of induced mutagenesis activities for crop improvement is requried. This book covers both basic and applied aspects of mutation and its impact on various crops: it is extremely well prepared and contains a huge volume of information accumulated using classically induced mutagenesis on different crops in different countries. Three key features: Describes the importance of induced mutation in crop plant research and its application to production Highlights new advances in the understanding of plant mutagenesis in crop improvement Contains contributions from major leaders in the field of plant mutation research This volume brings together all the important and relevant literature in the field. It provides a complete account of the mutation breeding of crops, presenting conclusions about the value of the method, its possibilities, limitations, and shortcomings, and the possible difficulties of further application in various crops. The initial chapters deal with the interactions between mutagenic treatment and plant material, such as aspects of mutagenic treatment, postirradiation behavior of shoot apices, and adventitious bud techniques. All available literature is then discussed crop by crop and critically evaluated. This will serve as an extremely comprehensive guide for researchers, teachers, students, and individuals who are interested in using induced mutagenesis as a tool for crop improvement.

Mutagenesis, Cytotoxicity and Crop Improvement Tariq Ahmad Bhat,2021-01-11 Induced mutagenesis is a common and promising method for the screening of new crops with improved production methods, and has made a tremendous contribution to crop improvement. Now, as the techniques of molecular biology become more widely adopted by plant breeders, this comprehensive summary sets mutation breeding within a contemporary context and relates it to other breeding techniques. This book opens a new chapter of inducing mutations at the gene level, and details techniques that can be used to harvest and exploit such mutation to improve the productivity of crops, particularly cereals, grains and vegetables. The chapters within this volume are supported by diagrams, tables and graphs to make the content more comprehensible.

The book will be extremely useful for advanced undergraduates, graduates, postgraduate students, and research scientists of botany, agriculture, horticulture, genetics, biotechnology, biochemistry and agronomy.

Mutation Breeding for Sustainable Food Production and Climate Resilience Suprasanna Penna,S. Mohan Jain,2023-04-04 This book highlights the recent progress on the applications of mutation breeding technology in crop plants. Plant breeders and agriculturists are faced with the new challenges of climate change, human population growth, and dwindling arable land and water resources which threaten to sustain food production worldwide. Genetic variation is the basis which plant breeders require to produce new and improved cultivars. The understanding of mutation induction and exploring its applications has paved the way for enhancing genetic variability for various plant and agronomic characters, and led to advances in gene discovery for various traits. Induced mutagenesis has played a significant role in crop improvement and currently, the technology has resulted in the development and release of more than 3600 mutant varieties in most of the crop plants with great economic impact. The field of 'mutation breeding' has come long way to become an important approach for crop improvement. This book covers various methodologies of mutation induction, screening of mutants, genome editing and genomics advances and mutant gene discovery. The book further discusses success stories in different countries and applications of mutation breeding in food crops, horticultural plants and plantation crops. This informative book is very useful to plant breeders, students and researchers in the field of agriculture, plant sciences, food science and genetics.

Crop Improvement and Mutation Breeding A.K. Sharma,Ramavtar Sharma,2014-01-01 The main objective of this book is to bring all the research activities of mutation breeding in one umbrella.

Genetic Validation and its Role in Crop Improvement Ahmed Sallam,Ahmad M. Alqudah,Peter Stephen Baenziger,Awais Rasheed,2022-11-08

Role of Classical Mutation Breeding in Crop Improvement S.K. Datta,2005 Crop improvement using classical induced mutagenesis is now well standardized. A large number of new promising varieties in different crops have successfully been developed world wide using both physical and chemical mutagens. Voluminous literature are now available on basic and applied aspects of mutagenesis. Mutation technique has been refined and holds promise of generating a much wider desirable variability than classical breeding. Recent advances in technology combined with classical mutation breeding offers new and exciting challenges for development of new varieties. There was necessary to compile worldwide activities on induced mutagenesis for crop improvement.The book covers both basic and applied aspects of mutation and its impact on different crops like vegetables, pulse, medicinal, edible and non-edible oil, ornamentals etc in different countries. The book is extremely well prepared and contains huge volume of informations accumulated using classical induced mutagenesis on different crops in different countries. The will serve as an extremely comprehensive guide to the researchers, teachers,

students and individuals who are interested to use induced mutagenesis as a tool for crop improvement. Contents Chapter 1: Use of Induced Mutations for Crop Improvement: Revisited by H Yamaguchi; Chapter 2: Mutation Breeding for Crop Improvement: A Review by M A Awan; Chapter 3: Mutation Breeding in Nigella sativa L (Black Cumin) by A K Biswas; Chapter 4: Improvement of a Value Added Medicinal Herb Trigonella foenum graceum L : Need and Approach by S K Datta & V L Goel; Chapter 5: Role of Experimental Mutagenesis for Genetic Improvement of Peas and Soybean by A Mehandijev; Chapter 6: Cowpea Mutation Breeding for Resistance to Bacterial Leaf Blight Disease (Xanthomonas vignicola Burk) by Sanit Luadthong; Chapter 7: Mutation Breeding: A Novel Technique for Quality Improvement of Winged Bean [Psophocarpus tetragonolobus (L) DC] by R D Dadka & V S Kothekar; Chapter 8: Quantitative and Qualitative Improvement in Brassica Oil Crops through Induced Mutation Technique in Bangladesh by M L Das & A Rahman; Chapter 9: Effects of Gamma Radiation on Jatropha curcas: A Promosing Crop for New Source of Fuel by S K Datta & R K Pandey; Chapter 10: Role of Mutation Induction for Wheat (T aestivum L) Improvement by Wange Lin-quing & LI Gui-ying; Chapter 11: Selection Studies on Mutant Barley Population by M B Yildrim, N Budak, Z Yildrim & T Kusaksiz; Chapter 12: Linkage Mapping Using Mutant Genes in Rice by T Kinoshita; Chapter 13: Classical Mutation Breeding and Molecular Methods for Genetic Improvement of Ornamentals by S K Datta & Debasis Chakrabarty; Chapter 14: Combination of Classical and Modern Methods for the Development of New Ornamental Varieties by A K a Mandal & S K Datta.

Advanced Crop Improvement, Volume 1 Aamir Raina,Mohammad Rafiq Wani,Rafiul Amin Laskar,Nasya Tomlekova,Samiullah Khan,2023-08-01 As per the reports of FAO, the human population will rise to 9 billion by the end of 2050 and 70% of more food must be produced over the next three decades to feed the additional population. The breeding approaches for crop improvement programs are dependent on the availability and accessibility of genetic variation, either spontaneous or induced by the mutagens. Plant breeders, agronomists, and geneticists are under constant pressure to expand food production by employing innovative breeding strategies to enhance yield, adaptability, nutrition, resistance to biotic and abiotic stresses. In conventional breeding approaches, introgression of genes in crop varieties is laborious and time-consuming. Nowadays, new innovative plant breeding techniques such as molecular breeding and plant biotechnology, supplement the traditional breeding approaches to achieve the desired goals of enhanced food production. With the advent of recent molecular tools like genomics, transgenics, molecular marker-assisted back-crossing, TILLING, Eco-TILLING, gene editing, CRISPR CAS, non-targeted protein abundant comparative proteomics, genome wide association studies have made possible mapping of important QTLs, insertion of transgenes, reduction of linkage drags, and manipulation of genome. In general, conventional and modern plant breeding approaches would be strategically ideal for developing new elite crop varieties to meet the feeding requirement of the increasing world population. This book highlights the latest progress in the field of plant breeding, and their applicability in crop improvement. The basic concept of this 2-volume work is to assess the

use of modern breeding strategies in supplementing conventional breeding toward the development of elite crop varieties, for obtaining desired goals of food production.

TILLING and Eco-TILLING for Crop Improvement Anjanabha Bhattacharya,Vilas Parkhi,Bharat Char,2023-07-10 This edited book is a comprehensive compilation of deliberations in the field of agriculture, food security, climate resilient crops and on the relevance of the popular TILLING technique in the era of precise genome editing (CRISPR/Cas9). This book particularly deliberates on new developments in this field, such as, induced mutagenesis techniques, mutagenesis in somatic tissues, bio-informatics analysis and gene mining. This volume also focuses on next generation mutation detection techniques, exome capture, forward and reverses genetics, trait selection and, finally deliberates on the future of TILLING in plant breeding and product development. TILLING (Targeting Induced Local Lesions in Genome) is a popular molecular biology technique for detecting polymorphism in a mutagenized population. Eco-TILLING refers to natural TILLING. This technique can be applied to a wider range of crops. Products developed through TILLING are not regulated throughout the world, thus having a wider acceptance among various stakeholders. This volume is timely and looks into the updated aspects of mutagenesis, TILLING, Eco-TILLING along with OMIC tools, their amalgamated applications towards crop improvement. This book contains 11 chapters and 250 pages authored by globally reputed scientists on the field of mutagenesis, TILLING and Eco-TILLING. This book is useful for research scholars, students, teachers and scientists in the academia, policy makers, relevant public, plant breeding companies, private companies and cooperatives interested in understanding or applying mutagenesis, TILLING for editing gene of interest and develop new products in agriculture.

Crop Improvement Khalid Rehman Hakeem,Parvaiz Ahmad,Munir Ozturk,2013-06-13 The improvement of crop species has been a basic pursuit since cultivation began thousands of years ago. To feed an ever increasing world population will require a great increase in food production. Wheat, corn, rice, potato and few others are expected to lead as the most important crops in the world. Enormous efforts are made all over the world to document as well as use these resources. Everybody knows that the introgression of genes in wheat provided the foundation for the “Green Revolution”. Later also demonstrated the great impact that genetic resources have on production. Several factors are contributing to high plant performance under different environmental conditions, therefore an effective and complementary use of all available technological tools and resources is needed to meet the challenge.

Mutations, In Vitro and Molecular Techniques for Environmentally Sustainable Crop Improvement M. Maluszynski,Kenneth Kasha,2013-03-09 During the last thirty years, most increases in agricultural production were achieved through high input agrieulture in areas with fertile soils and sufficient water. Intensive methods of production with high levels of nitrogen fertilizer and pesticides were often accompanied by environmental degradation and in some instances by pollution of the food supply. However, rapid population growth has also led to increasing use of marginal lands, where

adverse soil and climatic eonditions are serious constraints to food production. These areas are even more sensitive to ecological destabilization. Environmentally sound systems of food production and land use are essential for meeting the food security needs of developing countries. To do this, greater genetic variability is needed within the best crop genotypes available for the areas in need coupled with better management praetices and crop rotations. These requirements can only be realized if suitable crop varieties are bred. These should be varieties with a much shorter growing period, suitable for rotation, increased tolerance or resistance to diseases and pests as weil as to drought and salinity and other adverse soil and climatic conditions.

Induced Mutation Breeding Subodh Kumar Datta,2023-05-24 The book is an excellent reference collection of the research conducted by different workers on induced mutagenesis, worldwide, for more than 80 years. One can get almost all mutation breeding references at one place. The book gives a coherent and concise account of all the important and relevant aspects related to induced mutagenesis with an emphasis on recent developments in the field of crop improvement. The references have been arranged crop wise and important topic wise which deal with not only classical mutation breeding but also spontaneous mutations, somaclonal variations, nanoparticles, and relevant modern aspects. The book highlights 22 chapters covering holistic information on almost all important components such as radiosensitivity, chromosomal and morphological abnormalities, detection of mutation, management of chimera, present status of mutation etc.) of Mutation Breeding. Chapters are very informative, and one can follow the references on crop and aspect basis since the start of mutation breeding work. This book is an excellent resource for researchers and students for understanding proper applications of induced mutations in crop improvement and biological research. It is of interest and useful to graduate and postgraduate students, horticulturists, floriculturists, agricultural scientists, and breeders related to crop improvement program.

Mutation Breeding A. M. van Harten,1998-06-25 An essential and comprehensive summary for all plant breeders.

Advanced Crop Improvement, Volume 2 Aamir Raina,Mohammad Rafiq Wani,Rafiul Amin Laskar,Nasya Tomlekova,Samiullah Khan,2023-09-07 As per the reports of FAO, the human population will rise to 9 billion by the end of 2050 and 70% of more food must be produced over the next three decades to feed the additional population. The breeding approaches for crop improvement programs are dependent on the availability and accessibility of genetic variation, either spontaneous or induced by the mutagens. Plant breeders, agronomists, and geneticists are under constant pressure to expand food production by employing innovative breeding strategies to enhance yield, adaptability, nutrition, resistance to biotic and abiotic stresses. In conventional breeding approaches, introgression of genes in crop varieties is laborious and time-consuming. Nowadays, new innovative plant breeding techniques such as molecular breeding and plant biotechnology, supplement the traditional breeding approaches to achieve the desired goals of enhanced food production. With the advent of

recent molecular tools like genomics, transgenics, molecular marker-assisted back-crossing, TILLING, Eco-TILLING, gene editing, CRISPR CAS, non-targeted protein abundant comparative proteomics, genome wide association studies have made possible mapping of important QTLs, insertion of transgenes, reduction of linkage drags, and manipulation of genome. In general, conventional and modern plant breeding approaches would be strategically ideal for developing new elite crop varieties to meet the feeding requirement of the increasing world population. This book highlights the latest progress in the field of plant breeding, and their applicability in crop improvement. The basic concept of this 2-volume work is to assess the use of modern breeding strategies in supplementing the conventional breeding toward the development of elite crop varieties, for obtaining desired goals of food production.

Genetic Manipulation for Crop Improvement V. L. Chopra,1985

Omics Approach to Manage Abiotic Stress in Cereals Aryadeep Roychoudhury,Tariq Aftab,Krishnendu Acharya,2022-05-30 The edited book highlights various emerging Omics tools and techniques that are currently being used in the analysis of responses to different abiotic stress in agronomically important cereals and their applications in enhancing tolerance mechanism. Plants are severely challenged by diverse abiotic stress factors such as low water availability (drought), excess water (flooding/ waterlogging), extremes of temperatures (cold, chilling, frost, and heat), salinity, mineral deficiency, and heavy metal toxicity. Agronomically important cereal crops like Rice, Wheat, Maize, Sorghum, Pearl Millet, Barley, Oats, Rye, Foxtail Millets etc. that are the major sources of food material and nutritional components for human health are mostly exposed to abiotic stresses during the critical phases of flowering and grain yield. Different Omics platforms like genomics, transcriptomics proteomics, metabolomics and phenomics, in conjunction with breeding and transgenic technology, and high throughput technologies like next generation sequencing, epigenomics, genome editing and CRISPR-Cas technology have emerged altogether in understanding abiotic stress response and strengthening defense and tolerance mechanism of different cereals. This book is beneficial to different universities and research institutes working with different cereal crops in the areas of stress physiology, stress-associated genes and proteins, genomics, proteomics, genetic engineering, and other fields of molecular plant physiology. The book can also be used as advanced textbook for the course work of research and master’s level students. It will be of use to people involved in ecological studies and sustainable agriculture. The proposed book bring together the global leaders working on environmental stress in different cereal crops and motivate scientists to explore new horizons in the relevant areas of research.

Plant Hormones in Crop Improvement M. Iqbal R Khan,Amarjeet Singh,Peter Poor,2023-02-13 Plant Hormones in Crop Improvement examines the signaling pathways and mechanisms associated with phytohormones, with particular focus on stress resilience. The growing population of world and unpredictable climate puts pressure on the agriculture production. Current constraints such as increasing temperatures, drought, salinity, cold, nutrient deficiency, along with biotic

interactions trigger exquisitely tuned responsive mechanisms in plants. The main coordinators of all stress-related mechanisms are phytohormones, which can be transported over long distances and play a significant role in controlling physiological, agronomic and growth traits, metabolites and sustained crop productivity. Therefore, understanding the mechanisms influencing the stress responses mediated by phytohormones is crucial to ensure the continuity of agricultural production and food security. This book aims to address sustainable agricultural approaches to improve biotic and abiotic stress resilience in crop plants, covering different topics from perception and signaling plant hormones to physiological and molecular changes under different cues. Plant Hormones in Crop Improvement is an essential read for students, researchers and agriculturalists interested in plant physiology, plant genetics and crop yield improvement. - Comprehensive review of phytohormone pathways and mechanisms in relation to stress tolerance - Crosstalk between phytohormones and signaling molecules under optimal and stress affiliated responses - Omics approaches in plant responses to stress adaptation

Molecular Techniques in Crop Improvement Shri Mohan Jain,D.S. Brar,2009-11-05 This book provides comprehensive information on the latest tools and techniques of molecular genetics and their applications in crop improvement. It thoroughly discusses advanced techniques used in molecular markers, QTL mapping, marker-assisted breeding, and molecular cytogenetics.

Omics-Driven Crop Improvement for Stress Tolerance Weicong Qi,Jian Chen,Yi Han,Zhen Li,2023-08-07

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