Foreword

The elucidation of the double-helix structure of the Deoxyribose Nucleic Acid (DNA) molecule in 1953 by Drs. James Watson, Francis Crick, Maurice Wilkins and Rosalind Franklin marked the beginning of what is now known as *the new genetics*. Research during the last 54 years in the fields of molecular genetics and recombinant-DNA technology has opened up new opportunities in agriculture, medicine, industry, and environment protection.

Availability of DNA-based molecular markers since 1980s has facilitated construction of complete genetic maps in several plants of academic and economic importance. Several computer software also have paved the way for handling huge numbers of markers and segregating individuals to frame these maps, also for detection of positions of genes and gene clusters, known as quantitative trait loci, on them.

Molecular marker-based genetic mapping has provided not only comprehensive depictions of the genomes but also facilitated elucidation of phylogenetic relationships and evolutionary pathways, map-based cloning of genes and above all use of molecular markers in various schemes of crop improvement, including germplasm characterization, marker-aided selection and introgression of genes through marker-assisted backcross breeding.

The strategies of construction of BAC and YAC libraries and advent of high-throughput sequencing of DNA have built the platform for physical mapping of chromosomal regions and even whole genomes. The new millennium has already witnessed complete sequencing of the genomes of the model plant *Arabidopsis* and the leading crop plant rice followed by the genomes of a forest tree poplar and a fruit tree peach. Genome initiatives in many more crop plants individually and families comprising important crop plants are indeed progressing fast.

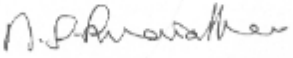
One of the spectacular happening during this period is the merging of information technology and biological science leading to a new discipline called as bioinformatics. This subject is now playing a pivotal role in warehousing biological data on sequences and functions of genes, transcripts, expressed sequence tags and proteins, and their searching to utilize for various purposes. We have now several new branches with the 'omics' sciences such as genomics, transcriptomics, proteomics and metabolomics. However, all of them relates to the genomes and reside under the common roof of genomics.

There is little doubt that the genomics has opened up uncommon opportunities for enhancing the productivity, profitability, sustainability and stability of major cropping systems. It has also created scope for developing crop varieties resistant/tolerant to biotic and abiotic stresses through an appropriate blend of Mendelian and molecular breeding techniques. It has led to the possibility of undertaking anticipatory breeding to meet potential changes in temperature, precipitation and sea level as a result of global warming. There are new opportunities for fostering pre-breeding and farmer-participatory breeding methods in order to continue the merits of genetic efficiency with genetic diversity.

In the coming decades, farm women and men in population-rich but land-hungry countries like India and China will have to produce more food and other agricultural commodities to meet home needs and to take advantage of export opportunities, under conditions of diminishing per capita availability of arable land and irrigation water and expanding abiotic and biotic stresses. The enlargement of the gene pool with which breeders work will be necessary to meet these challenges. Genomics supplemented by transgenics provide breeders with a powerful tool for enlarging the genetic base of crop varieties and to pyramid genes for a wide range of economically important traits.

Genetics can boast of being the subject that progressed with the most rapid speed within the shortest period of time and contributed stupendously in unraveling the nature and function of genes and also towards the genetic improvement of useful microbes, animals and plants in the last century. In fact, the *green revolution* of the sixties was the contribution of classical genetics and conventional breeding. Another revolution in agriculture, medicine and environment is in the wing and we are ready to welcome it as *gene revolution* to be drived by genomics-aided breeding. However, for a meaningful and sustainable application of plant genomics, importance of *orphan* crops which have immense potential for improving food and nutrition security should be taken into account.

The book series "Principles and Practices of Plant Genomics" is thus a timely contribution. It provides an authoritative account of recent progress in plant genomics including structural and functional genomics and their use in molecular- and genomics-assisted breeding. It also provides a road map for genomic research in the present century. I express our gratitude to Profs. Chittaranjan Kole and Albert Abbott for this labor of love in spreading knowledge among both students and scientists on the opportunities as well as challenges opened up by the genomics era.



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