

Preface

For understanding genes of different organisms and their manipulations for human benefit, it is essential to understand the structure and function of their genetic material at the molecular level. Further, in case of plants it is essential to protect the crop varieties against biotic and abiotic stresses whereas in case of humans it is necessary to protect them from many killer diseases. These problems can be solved only by understanding the genes and the genomes of these species and their related wild and weedy species. This book describes the genetic material (DNA, RNA), its structure and function. Gene, its structure and regulatory elements- promoter, enhancer and silencer are described. Genetic code and other types of codes, RNA editing and DNA imprinting are described. Structural genomics and functional genomics technologies are described to understand the structure and function of genes at individual gene level and at genome-wide level. Study of genes' products- the proteins are as important as the study of genes' immediate products- the transcriptome and so proteins and proteomics are discussed in detail. Further, genes do not work in isolation rather they work together as pathways and networks. Then there are different types of interactions such as DNA x protein, RNA x protein, DNA x RNA and protein x protein and techniques for studying various types of interactions are discussed. It is also important to understand the cell function at the molecular level using systems biology approach. Sequencing is the best way to characterize a gene, its regulatory elements and genome whereas chemical synthesis of DNA is essential for designing gene, regulatory elements, probes and primers and both can help in tailoring an organism. Isolation of gene, gene cloning and *in vitro* mutagenesis are important for studying gene structure and function. Gene silencing through antisense RNA and RNAi can help in understanding the gene function and has practical implications. Finally, various molecular cytogenetics techniques and genetic engineering techniques described in this book will help in setting up experiments. This book provides the latest methods of analyses and technologies for studying structure and function of genes and genomes. Finally, applications of bioinformatics tools in sequence assembly and in structural and functional genomics and proteomics have been described.

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