

Book Reviews

Plant Cytogenetics. 2nd ed. 2006. Ram J. Singh. CRC Press, Boca Raton, Fla. 463 p. ISBN 0-8493-2388-6.

Ram J. Singh received his PhD in plant cytogenetics from Colorado State University and is currently Agronomist-Plant Cytogeneticist in the Department of Crop Sciences at the University of Illinois at Urbana-Champaign. His pioneering research in barley, rice, rye, wheat, and soybean has been widely published in major professional journals. The first edition of *Plant Cytogenetics* by Ram J. Singh has long been an important reference and teaching text for the study of plant chromosomes since it was published in 1993. There have been significant technological advances in the decade since it was first written. This welcome new edition expands the older text and brings it up-to-date on the latest technologies.

The introduction lays the foundation of cytogenetics as a hybrid science that combines cytology (the study of cells) with genetics (the study of inheritance) through microscopic examination and classification of chromosomes (the complex, gene-containing organelles in the nucleus). It involves staining techniques and methods for handling chromosomes, karyotype analysis of chromosome structure and numbers, and aspects of cell division and reproduction including mitosis, meiosis, recombination, and evolutionary changes in chromosome biology. More recent advances in molecular biology have led to new techniques for in situ hybridization where single genes can be located to a specific chromosome, chromosome painting can reveal details about gene arrangements and chromosome organization, and genetic engineering that allows insertion of genes from completely different organisms into the chromosomes of a plant or animal. A new feature of the Introduction is a wonderful timeline beginning with Euclid's discovery of optical properties of curved surfaces in 300 B.C. and extending through the mapping of the complete rice genome in 2002. This provides an excellent, concise snapshot of the historical development of the field of cytogenetics.

The second chapter has retained the staining recipes and techniques for preparing roots, cell cultures, and flowers for microscopic examination of chromosomes, and has added new information about in situ hybridization and flow cytometry techniques. Chapters 3, 4, and 5 cover cell division, meiosis and plant reproduction. Chapters 6, 7a, and 7b thoroughly cover all aspects of karyotype analysis, structural aberrations, and changes in chromosome architecture, as well as changes in chromosome number. Singh's discussion of how such anomalies have been applied for crop improvement through development of new species for use in plant breeding puts this detailed knowledge into useful perspective. Chapters 8, 9, and 10 focus on genome analysis using molecular tools, changes in chromosomes in cell and tissue cultures, and genetic engineering of transgenic crops. The appendices have been significantly expanded in this edition to include sources of chemicals, materials for flow cytometry, recipes for reagents and solutions, and media preparation. A valuable new feature is a table of the common and scientific names of important crop plants with their diploid chromosome number. Comparing the half-page linkage map of barley in the 1993 edition to the four-

page map in this edition underscores the dramatic advances that have occurred in the interim decade between publications. I highly recommend this rigorous, informative volume to anyone interested in plant chromosomes.

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