

## BOOK REVIEWS

**Plant Breeding – Theory and Practice.** V. L. Chopra (ed.). Oxford and IBH Pub Co Pvt Ltd, 66 Janpath, New Delhi 110 001. 2000. 2nd edn. 490 pp. Price: Rs 395.

Plant breeding involves improvement of germplasm leading to the development of new varieties that are superior to existing cultivars in one or more of the many desirable attributes, that are relevant to improvement in their productivity. These desirable attributes may be transferred from available germplasm of the crop through hybridization or from other resources using a variety of novel tools, like tissue culture and genetic engineering. In the 21st century, these novel tools as well as the science of reverse genetics and genomics involving determination of nucleotide sequences of entire genomes of plants like *Arabidopsis thaliana* and rice will certainly transform the art and science of plant breeding. In view of this, writing or editing a book on plant breeding and/or its revision has become more important, but also more difficult, today than ever before. In view of this, the book under review is a welcome addition to several books on plant breeding that have been published in recent years, although in my opinion, none of these books, including the present book under review, could match the classic *Principles of Plant Breeding* by R. W. Allard published in 1960 (not even the second edition of this book published recently) by John Wiley & Sons Inc, New York.

As mentioned by the editor in his preface, the book under review may need to be used by students and teachers with a companion volume entitled *Breeding Field Crops*, which is not available for the present review. In fact, the first edition of this book has been revised to produce two books, the second edition with the old title under review and a new title *Breeding Field Crops*, dealing with case studies involving different aspects of breeding individual crops. Major parts of chapters 2 and 3 of the first edition (accounting for more than 150 pages) have perhaps been transferred to the new title *Breeding Field Crops*. Perhaps it would have been better if these two volumes were published as Volumes 1 and 2 of the second edition, lest the readers without

reading the preface may get an impression that useful subject matter on individual crops (covering little less than half of the first edition) has been dropped in this second edition.

In the first edition itself, the editor had invited the best expertise on the subject available in the country to write chapters dealing with the basics of plant breeding for self-pollinated, cross-pollinated and vegetatively propagated crops. These chapters have rightly been retained in the second edition, which covers both conventional as well as the so-called modern methods of plant breeding. For the portion dealing with conventional plant breeding, new authors have been invited for only two chapters (vegetable crops and breeding for quality), which have been rewritten. Several new chapters have also been added, and the editor himself has written or co-authored as many as 8 of the 21 chapters (as against 2 of the 12 chapters in the first edition). Some of the new chapters deal with new topics on conventional plant breeding such as breeding of ornamentals, participatory approach, research at International Agricultural Research Centres (IARCs) and seed production and certification. Useful new information in the emerging areas of plant breeding has also been added in the form of several chapters (e.g. innovative approaches in plant breeding, molecular breeding, plant transformation, IPRs and biosafety issues), that have also been written by the editor and his associates, although in some of these chapters the information is either inadequate (perhaps to contain the size of the book) or else already out of date. In chapter 5 on disease resistance, there is a welcome addition of a short account on molecular mechanism of disease resistance, the subject which is growing exponentially, and in chapters 18 and 19 molecular marker technology and transgenic crops have been dealt with. However, the role of genomics in plant breeding has not been discussed in any of these chapters or elsewhere in the book.

In this second edition of the book, the chapters retained from its first edition have largely and unfortunately been reproduced verbatim and have neither been subjected to the desired revision (except insertion of one or more paragraphs), nor even carefully proof-read by the authors or the editor, so that sev-

eral mistakes or printing errors, which were present in the first edition are reproduced in the second edition also. Some of the conspicuous mistakes noted by the reviewer (while critically reading only the first few pages) include mistakes in table 1 on page 3 (expected mean squares for varieties should be  $\sigma^2_E + 5\sigma^2_G$ , instead of  $V_G + 5V_E$ ). Similarly on page 8, for full-sib mating, frequency of heterozygotes retained after 10 generations of selfing should be 56/512, instead of 35/512. Furthermore throughout chapter 1, expressions like 2.1/2.4 and 2.1/4 should have been written as  $2 \times \frac{1}{2} \times 4$  and  $2 \times \frac{1}{4}$ , respectively to avoid confusion. There are also spelling mistakes (e.g. Johansen for Johannsen on page 25). I have no doubt that a critical reading of the book will detect many more such mistakes. The editor may like to get these mistakes removed in the next reprint, to make the book more reader-friendly.

In a volume like the above, it was indeed unavoidable to describe different breeding approaches (conventional, innovative and molecular) for the same group of crops in more than one chapter. Under these circumstances, if cross-references of chapters were available, it would help the readers retrieve the extended desired information on the same topic from more than one chapter. For instance, while dealing with breeding of self-pollinated crops, there is no reference to haploid breeding or heterosis breeding (hybrid varieties in rice), alien gene transfer, use of synthetics in wheat breeding and possible future use of apomixis for fixing heterosis (although some of these topics are covered elsewhere in chapter 17). Thus, while reading chapters 2 and 3 on breeding procedures in self and cross-pollinated crops, the reader would not know that for the breeding of the same group of crops, information on other unconventional (innovative) breeding methods, including mutation and molecular breeding is available elsewhere in the book. Several such examples can be given and in such cases if the editor had done cross-referring, it would have added to the value of the book. Unfortunately, this has not been done.

Despite some shortcomings as mentioned above, the book should prove useful to students and teachers who have the quest to learn more about plant breeding including the new emerging

technologies. My colleagues at Meerut will certainly use the book as a supplementary source of new information for teaching plant breeding to our students.

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**Annual Review of Phytopathology.** Robert K. Webster *et al.* (eds). Annual Reviews, 4139 El Camino Way, P. O. Box 10139, Palo Alto, California 94303-0139, USA. 2000. Vol. 38. 646 pp. Price: US \$154.00

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I prefer to review the 38th volume of *Annual Review of Phytopathology*, which is also the new millennium issue, referring to the important statement of Luis Sequeira from the first article 'Legacy for the Millennium: A Century of Progress in Plant Pathology' – 'The past century witnessed the growth of plant pathology as an important and dramatic challenge to meet the demands for increased food, fibre and fuel production from a declining agriculture base'. Consolidating this past, the new century is witnessing exciting developments due to the changes in global scenario, public need and new challenges in food security through newer tools available from bioinformatics, molecular biology and recombinant DNA technology. In this context, the book under review has consolidated the progress of plant pathology made over the last years and projected the trends for the future. The editors have carefully brought out this volume with twenty-three articles, beginning with the biographical work of Shear in 'C. L. Shear: Gifted mycologist, plant pathologist, and APS founder' by P. D. Peterson and C. S. Griffith, and a retrospective view on the understanding of host-pathogen interactions by N. T. Keen. Other articles focused on include epidemiology, diseases caused by viruses, genes and genetic diversity, specifics of plant diseases and plant disease management. The chronology of events from the last

millennium beginning with the birth of plant pathology, its services to plant growers, advancements in biotechnology and genetics, with an international scope towards globalization have all been well described. Hence, this volume of *Annual Review of Phytopathology* is in itself an important textbook for beginners, historians, researchers and scientists who are concerned with enhancing agricultural productivity of this century.

Epidemiology, the study of diseases in populations, is a branch of plant pathology that generates information on the interaction of host, pathogen and environment and has applications in development of disease management strategies. The general article by P. E. Waggoner and D. E. Aylar reviews the epidemiology of plant diseases known over the last century in comparison with medical epidemiology. The two other articles describing the epidemiology of leaf and stem rust fungus of wheat and the dispersal pattern of *Phytophthora* are specific in nature, substituting the views of the former authors. The three articles together, apart from integrating observations on the interplay of pest, photosynthesis and supply and demand to reckon losses in agriculture, also deal in detail with strategies used to manage diseases, understanding diversity of pathogens, genetic inheritance of resistance and pathogenicity and influence of weather on spreading of disease. These read together with contributions made in the twentieth century on plant health management, clearly bring out the advancements in the last century that made food production exceed demand on a global basis.

Understanding the molecular mechanism of defence in plants and the factors that trigger resistance will aid in isolating and characterizing the *R* gene(s) of host and *avr* gene(s) of pathogen that have application in plant quarantine and development of management strategies. In this context, the article on 'Modulation of plant defense responses by bacterial lipopolysaccharides', the ubiquitous, indispensable components of Gram-negative bacteria, by Dow *et al.* is appropriate. Similarly, the article on 'Role of mitochondrial DNA in the senescence and hypovirulence of fungi and the potential for plant disease control' gives an account of occurrence of mitochondrial hypoviru-

lence in phytopathogenic filamentous fungi under natural conditions and suggests its possible exploitation as biocontrol agent.

Another area of research extensively covered in this volume through six articles is plant disease management. The article 'Advances in plant health management in the 20th century' reviews the biotic and abiotic factors that restrict plants from expressing their full potential. This article also outlines contributions of biocontrol to plant health management. The article by B. R. Kerry on 'Exploitation of microbial agents for biocontrol of nematodes' describes the various interactions between plant-parasitic nematodes and rhizosphere microbial flora'. It highlights the importance of hosts in the development of biocontrol strategies, the success of which depends on the understanding of interactions at population, organismal and molecular levels.

Molecular technologies of detection are currently becoming central for plant disease management. The article on the 'Impacts of molecular diagnostic techniques on plant disease management' covers the historical outline of various methods used for detection before the development of ELISA and the impact of the advent of molecular biology leading to the development of PCR-based detection techniques. Covered in this article are also the case studies illustrating the application of these techniques for detection of micro-organisms, especially fungi and viruses in certification programmes, plant quarantine, disease management and crop production. The future prospects of nucleic acid-based and antibody-based microarrays for disease diagnosis are also highlighted.

Another article of interest is that on the 'Impact of food safety concerns on the future of disease management' by N. N. Ragsdale. One of the major discoveries in plant pathology is that of fungicides that has helped in the green revolution, supplying low-cost food items to the ever-increasing human population. However, in the recent years, lot of concern is shown towards use of pesticides due to their effects, especially on human health and environment, resulting in the development of food safety measures which restrict the use of fungicides. The article by N. N. Ragsdale, while analysing pesticide risks has clearly brought out the