Book Reviews

Horticultural Reviews, Volume 22. Jules Janick (ed.). 1998. John Wiley & Sons, Inc., 605 Third Ave., New York, NY 10158-0012. 324 p. $145.00, hardcover. ISBN 0-471-25444-4.

An international array of distinguished authors has been assembled by Editor Janick for Volume 22 of *Horticultural Reviews*. This volume has seven reviews by 10 authors from seven different countries. Four chapters review the status of horticultural crops: *Banksia, Leucospermum*, apricot, and tea; two chapters review postharvest topics: heat treatments and modified atmosphere storage for tropical fruits; and one chapter is devoted to nitrogen use in vegetable crops.

Banksia, a native Australian proteaceous plant, has been grown commercially there for the international and domestic cut-flower market for about 25 years. There is considerable interest in production in other parts of the world so this review is timely.

Other proteaceous cut-flower crops include several species of *Leucospermum*. These crops have been commercially produced for over 70 years in South Africa and are now grown in the United States (Hawaii and California), Australia, New Zealand, Israel, and to a lesser extent in several other countries as well. These flowers are valued for their unique beauty and long-lasting qualities.

I particularly enjoyed reading the reviews on apricot and tea because I was not especially familiar with these horticultural crops. Both have a long history of culture and use that have developed along national and ethnographic lines that unfortunately is now being obscured by the globalization of CNN, McDonalds, and the like.

The reviews on postharvest horticulture and nitrogen nutrition of vegetables offer up-to-date information for those concerned with these topics.

Overall, the chapters are of high quality despite a bit of unevenness that occurs with multi-authored volumes. I noted some inconsistency in use of units with both U.S. and metric units appearing in the same chapter. Some references in one chapter were poorly done, with errors in author names and citations noted.

Each volume of *Horticultural Reviews* honors a distinguished horticulturist with a dedication. Frank G. (Hawkeye) Dennis, Jr. is so honored in Volume 22. He is characterized as being a teacher, scholar, researcher, cooperator, mentor, adviser, pomologist, poet, historian, and friend. All true as far as I know. Frank, recently retired, spent most of his career at Michigan State Univ. He continues to serve his profession as Science Editor of *HortScience*. Congratulations and thanks.

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Horticultural Reviews, Volume 23. Jules Janick (ed.). 1999. John Wiley & Sons, Inc., 605 Third Ave., New York, NY 10158-0012. 366 p. $145.00, hardcover. ISBN 0471254452.

Since first produced in 1979, *Horticultural Reviews* has provided a valuable service to horticulturists. Initially it was an annual; more recently, volumes are released as they are completed. At least three and possibly four, depending on how one counts, publishing houses have been involved in production and marketing of the series. Only one editor, Jules Janick, has been responsible throughout. All horticulturists are indebted to him for his dedication to this project.

The current volume, 23, has six chapters; three devoted to specific horticultural crops: plums, loquat, and sweetpotato. The remaining chapters focus on plant epicuticular waxes, chlorophyll fluorescence techniques in postharvest physiology, and zinc nutrition of horticultural crops. In any volume that includes diverse topics under a general umbrella, one is certain to find variation in interest among the topics. I found the chapter on plant epicuticular waxes to be of considerable interest.

Surface waxes, although of diverse composition, all provide a barrier between the plant and its environment. The physical and chemical nature of the wax contributes to resistance to stresses caused by fungal pathogens, phytophagous insects, drought, solar radiation, unfavorable temperatures, mechanical abrasion, and atmospheric contaminants such as ozone and acid rain. Furthermore, the efficacy of pesticide, herbicide, and growth regulator foliar applications may be influenced by epicuticular waxes. Some plant waxes such as carnauba have important industrial applications.

Keeping with an established tradition of honoring a distinguished horticulturist, this volume is dedicated to Shang Fa Yang, an eminent postharvest physiologist who spent most of his career at the Univ. of California, Davis. Shang Fa's research led to our understanding the biosynthesis of ethylene. Aside from his prodigious scientific accomplishments, Shang Fa is a warm, compassionate human being.

Each article is extensively documented; there is a volume subject index and cumulative subject and author indexes. In recent years, *Horticultural Reviews* has become pricey—$145.00—especially for students and recently appointed faculty. Nonetheless, it becomes part of the set that has immeasurable value in total.

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Plant Breeding and Whole-system Crop Physiology. Improving Adaptation, Maturity, and Yield. D.H. Wallace and W. Yan. 1998. CAB International. Available from Oxford University Press, 198 Madison Ave., New York, NY 10016. 390 p. $100.00. ISBN 0-85199-265-X.

Many scientists in today's agricultural research sector are aware of a trend toward funding reductive research projects at the expense of whole-systems research . The expansion of reductive research is due in part to an ever-growing palette of sophisticated tools available to the experimentalist and in part to a desire for yes or no answers to biological questions. In recent years, advances in molecular biology and electronics have made the search for fundamental biological questions easier to ask and answer. While reductive approaches have proved tremendously successful at opening windows into basic biological systems, there is a growing concern that this trend has succeeded in reducing efforts aimed at organismal biology. Writing in *Naturalist*, entomologist E.O. Wilson described how, in the early days following the discovery of the DNA double helix, James Watson predicted the demise of organismal biology at the hands of the new reductionist science of molecular biology. Unfortunately, what has been lacking is neither the whole-system approach nor the reductive approach but an integration of the two. It is therefore refreshing to see the arrival of *Plant Breeding and Whole-system Crop Physiology* by Wallace and Yan. This book carries the laudable premise that whole-system research should complement reductive research efforts toward the goal of improving agriculture.

The book is divided into a series of 32 current paradigms, each of which is presented with a suggested "paradigm shift." In some cases, entirely new paradigms are suggested, while in others the authors recommend the expansion of a paradigm to include additional subject matter and/or direction. All 32 current paradigms and their accompanying revisions are presented in Chapter 1. As a mechanism for introducing the subject matter of the book, the list presented in Chapter 1 is very stimulating. However, upon closer examination, it is not clear that all of these current paradigms really fall into the definition of what a plant biologist might generally consider a paradigm. For example, current paradigm 22 states "it is too time consuming and expensive to measure the aerial biomass in ongoing yield trials." One wonders to what extent such an opinion has been generalized and for which crops this may apply when reading the opening chapter. Several other paradigms prove equally difficult to comprehend from this introductory section, and their meaning cannot be directly extracted from the paradigm shift section unless the reader turns to the subsequent chapters and attempts to follow the arguments. An example is current paradigm 23, which states the following in describing the nature of quantitative traits: "Second, this potential becomes a continuum of a small to large level of the

available intraplant metabolites and this level constitutes a near-constant-capacity system for all the genotypes of the species. Third, whatever the available quantity of the intraplant metabolites, the expression of every quantitative trait requires a large proportion of these metabolites. Fourth, this forced sharing within the plant system of the available metabolites accounts for much of the control by many genes over each of all the quantitative traits." Sentences such as these are made even more confusing by the lack of data presented on such intraplant metabolites and the lack of information on their role in regulating trait expression.

The 32 paradigms in this book are divided into nine sections, including the relationship between photosynthate partitioning and photoperiodic gene activity, the vernalization response and temperature, genotype × environment interactions, and breeding for adaptation and yield. At the core of these sections is a plan to incorporate whole-system approaches into plant-based agricultural research. Whole-system research is defined as the measurement of the ultimate output of a system, plus all of the penultimate outputs from the system, with both multiple genotypes and environments taken into account. The authors should be applauded for encouraging an integrated approach where all phenotypes are recognized as results of specific genotype × environment interactions. The only way to approach the study of such phenotypes is to better understand both the environmental influences and the plant responses.

Chapter 3 discusses various methods designed to estimate environmental effects of biomass accumulation. Many sections in this chapter are recitations of papers presented in the 1960s and 1970s by the authors and other scientists. While these provide an interesting historical framework, they do not provide current perspectives on the field. Subsequent chapters focus on partitioning of photosynthate, days to maturity, photoperiodic effects, and interactions among temperature, vernalization, and photoperiod. These chapters contain a tremendous amount of data and theoretical framework for understanding the complex relationships between environmental factors and crop production. Many of the arguments presented are interesting and worthy of consideration, although obvious in its absence was mention and discussion of recent research concerning the phenotypic and genetic characterization of recently identified vernalization genes in a variety of species. Overall, there is almost no information presented on the effects of individual genes governing responses to the major environmental factors discussed by the authors. Such information would be of great value in dissecting the phenotype into its environmental and genetic components.

Chapter 9 focuses on yield systems analysis and suggests ways that yield trial information can be supplemented in order to gain a better understanding of crop systems. In addition, the authors review and present the Additive Main effects and Multiplicative Interaction effects (AMMI) analysis procedure for yield system analysis. Even though this procedure offers challenges in the form of mathematical models, it certainly provides insight into some of the primary traits that influence crop yield. Crop biologists can benefit from examining these parameters in order to gain a better understanding of the interaction among yield components. In addition, these sections may be of great value to students in a whole-plant crop physiology course at the graduate level.

Despite the first two words of the book's title, there is very little information on plant breeding contained in its chapters. One of the chapters with a bit of plant breeding strategy is Chapter 10, which focuses on interplant competition. This chapter contains puzzling statements, such as "Experienced breeders need not measure the plant yield directly. The yield can be judged visually." And, "It is safest to select against traits known to be definitely 'bad' traits for the target environment….with this 'safe discard' policy, Yan et al. estimated that at least 75% of the plants of a segregating population can be discarded with confidence." Statements such as these do not promote a sense of rigor to the whole-systems approach advocated by the authors.

Chapter 12 is billed as a section on maximizing efficiency of breeding for higher crop yield. However, statements such as "Shift 28 is that selection for a physiological-genetic component trait, which is intended to give indirect selection toward higher levels of a system output such as yield, must always be toward whichever of a lower or a higher level of that trait that will establish a more optimal system functioning within the given environment" are not easily understood in any context. The section entitled "Breeding of Higher Yielding Cultivars" focuses only on self-pollinated species and includes a section seemingly suggesting anther culture as a relatively new method for producing homozygous lines. In fact, anther culture has been known for nearly 30 years as a breeding technique and has been applied with varying degrees of success in many crop species. In suggesting a breeding strategy that would complement a systems approach, the authors suggest a procedure called the whole-system, diverse-component, recurrent selection breeding method. Rather than recurrent selection, this method is essentially a single seed descent procedure, as only one single cycle of recombination is accomplished. Further, this method is only applicable to self-pollinating species as it is unlikely some of the cross-pollinated species would be inbred to the S_5-S_7 for performance trials due to inbreeding depression. Despite these curiosities, Chapter 12 does present some useful information for the plant breeder. Most importantly, the authors argue that while breeding for yield per se will never be supplanted as an approach to gaining higher yields, those quality factors that are negatively associated with yield will hinder the process.

Chapter 13 encourages multidisciplinary collaboration in order to accomplish a whole-system approach to crop production. This is certainly among the most laudable chapters in the book and deserves praise for its emphasis not only on collaboration among scientists but between scientists and the general public regarding the value of holistic approaches to scientific investigation. Perhaps the greatest strength of this book is its suggestion that there is value to a systems perspective in crop biology. Through theoretical models and substantial field data, the authors do an excellent job persuading crop biologists to consider more realistic and holistic models in estimating important yield-related parameters in crop production.

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Controlled Atmosphere Storage of Fruits and Vegetables. A.K. Thompson. 1998. Oxford University Press, 198 Madison Ave., New York, NY 10016. 278 p., 32 illus. $100.00, hardcover. ISBN 0-85199-267-6.

The interest in controlled and modified atmospheres continues to increase among both the produce and ornamentals industries and postharvest researchers. This latest book on the topic is divided into two sections; the first is a general section on controlled atmospheres and the second includes specific recommendation for individual commodities. The general discussion of controlled atmosphere comprises about 50% of the book and includes the following: 1) introduction and history of controlled atmosphere use in the United States and United Kingdom, 2) construction of and equipment for controlled-atmosphere storage, 3) controlled atmospheres during transport, 4) hypobaric storage, 5) safety considerations, 6) effects of controlled and modified atmospheres on flavor and quality, 7) effects of controlled and modified atmospheres on insects, diseases, and physiological disorders, 8) interaction of ethylene, temperature, and relative humidity with controlled atmospheres, 9) high-oxygen storage, and 10) modified-atmosphere packaging. The coverage of modified-atmosphere packaging is particularly thorough. The actual division of topics into headings appears excessive with numerous small sections. In the second half of the book, recommendations for controlled-atmosphere conditions are given for 102 different species of fruits and vegetables, including temperate, subtropical, and tropical commodities. Both scientific and common plant names are given. A small number of black and white photos are included, which are of good quality and illustrative of various processes, as well as a number of informative figures and tables.

This book includes a worthwhile compilation of literature related to controlled and modified atmospheres. However, it is written more like a review than a textbook. A second edition would benefit from more compilation, summarization, and analysis of information.

The lists of recommendations given are often contradictory, perhaps because of the age of some of the references and the improvements in controlled-atmosphere technology that have occurred over the years. This book is a good reference tool for faculty and students interested in controlled- or modified-atmosphere storage; however, much of this information is already available in the Proceedings of CA '97, which was held in Davis, Calif., in July 1997. The book would be of less interest to the practitioner because of the lack of analysis of the information provided; however, the extension agent or consultant should be able to analyze the information provided to make recommendations to clients.

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