Book Review

Plant Diversity and Evolution: Genotypic and Phenotypic Variation in Higher Plants

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"Plants are fundamental to life ...." and knowledge on plant life is fundamental to life sciences. This book presents excellent reviews, as selected by leading authorities, of the contemporary knowledge of the main topics in plant sciences and the achievements reached with modern methods. For biology enthusiasts the 15 chapters will bring a fascinating insight of plant evolution on the level of genotypic and phenotypic variations. But this book provides also an essential background for biology teachers and students alike, for taxonomists, plant researchers, nature conservationists, plant breeders, genebank curators and everyone faced with or interested in plant variability and diversity.

The introductory chapter considers the importance of plant diversity at all levels, from DNA to intact plant, from the diversity both within a plant species and at the level of communities and ecosystems. The two next chapters analyse the variability, diversity and evolutionary relationships of angiosperms (Chapter 2) and gymnosperms (Chapter 3), including the patterns of the evolution of their families.

Chloroplast genomes and the mitochondrial genomes of higher plants are subjects of Chapters 4 and 5. They outline the genetic variability on the extranuclear level which until now remain somewhat cryptic, due in part to the lack of assistance from the modern instrumental arsenal of DNA and RNA analyses.

The disclosure of reticulate evolution in higher plants (Chapter 6) elucidates many tortuous instances of natural hybridisation between divergent taxa, the occurrence of gene transfer between species as well as the collapse of gene flow barriers. Introgressive hybridisation, influenced by natural and anthropogenic disturbances, appears to be of growing importance for future evolution in the biosphere.

Chapter 7 opens an intriguing overview of the role and consequences of polyploid evolution in plants. Through it, such a pervasive phenomenon as the genome doublings during past periods of evolution (e.g. paleopolyploidy) acquires new relevance for future evolution of living things under climatic changes. Both the advanced research methodology and the impact of gene flow on the assemblage of plant populations over time and space are summarised in Chapter 9.

Crucifer evolution in the post-genomic era binds our attention in Chapter 8 to the plethora of more than 20 000 published papers on the molecular biology and genetics of *Arabidopsis*. Thale cress, *Arabidopsis thaliana,* has become the model of a flowering plant in nearly every field of experimental botany, and today is the first plant species for which the complete genome sequence has been determined. No wonder that such a plant, regardless of its minuscule dimensions, may have influenced our concepts of plant evolution e.g. to that of the head of cauliflower (Chapter 10, Evolution of the flower).

The next chapters (11 and 12) turn our attention to plant structures and events with practical aspects: to cell wall diversity as part of the organic carbon cycle, and to the secondary metabolism of plant cells with its extreme diversity and immense importance of its products on our lives.

All following parts contain numerous practical aspects. Chapter 13 deals with the ecological significance of plant diversity, the properties of ecological systems and basic aspects of a functioning ecosystem, including human threats and benefits for the ecosystems. Intriguing horizons are opened

by parts of this chapter that deal with theoretic (heuristic methods and approaches) and experimental approaches to research of diversity.

The author of Chapter 14, Genomic diversity in nature and domestication, lives in the Fertile Crescent, a region of great historic importance. Who could be better qualified than to focus on aspects of evolution under domestication of crops, mainly barley and wheat.

The editor of this extremely valuable and relevant book has not only the first (in Chapter 1) but also the last word. In Chapter 15, Conserving genetic diversity in plants of environmental, social or economic importance, he presents the logical culmination and main mission of research into plant diversity. He considers recent approaches to conservation of plant genetic diversity involving wild and cultivated plants *in situ*, in seedbanks and DNA banks, in botanical gardens as well as in living collections (arboreta, species-specific collections) and *in vitro* alternatives. Let me quote here his final sentence: "Plant diversity conservation will be greatly enhanced by these continuing technological developments (especially in molecular biology and bioinformatics), allowing very large amounts of biological and especially genetic data to be collected, stored and analysed."

In conclusion, this book is an excellent and comprehensive review and summarises all recent information about plant diversity and evolution at the various levels of biological hierarchy. Its contents are well arranged and easy to read and understand. The book will be of benefit to advanced students and postgraduates as well as to scientists and practical plant biologists engaged in plant biodiversity, evolution, genetics, plant sciences and agriculture.

This publication is available in Library of Department of Botany, Faculty of Science, Palacky University (sing. IV. 1088; inv. no. 18901).

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