



Biology and Evolution of Ferns and Lycophytes. Tom A. Ranker and Christopher H. Haufler (eds). Cambridge University Press, Cambridge, UK. 2008. 500 pp. Price: US\$ 68.

In the Preface, editors elaborate why they preferred using in the title 'Ferns and Lycophytes' over traditional 'Pteridophytes'. The book is an assemblage of various fields of research on ferns and lycophytes and is divided into four parts. As many as 16 chapters spread over 467 pages are written by authors numbering 28. All of them are experts in their respective fields. A 13-page index is indicative of the scientific matter the book contains.

Part I of the book 'Development and morphogenesis' contains three chapters. In chapter I, M. Wada highlighted the effects of light on different biological aspects of spore germination and gametophyte development. The author suggests that more research should be done on the various aspects of fern gametophytes. As is well known, the life cycles in the lower vascular plants are remarkably tricky due to several factors such as apogamy, apospory, polyploidy and gene silencing. These are beautifully described in the second chapter entitled 'Alternation of generations' by Elizabeth Sheffield. This chapter is not only useful for the students of botany to understand the life cycles of these plants but will also enable them to understand the evolution of two different phases in the life cycles of these plants. In chapter III, 'Meristem organization and organ diversity', Ryoko Imaichi describes the activity and behaviour of apical meristem, ontogeny of different organs, exo- and endogenous origin of leaves, branching patterns, etc.

Part II of the book entitled 'Genetics and reproduction' is dedicated to a subject which has always attracted the atten-

tion of reproductive biologists, molecular biologists and cytogeneticists because ferns are considered as convenient forms to understand various problems related to life cycle and genetics. In this part, different types of mating systems, effect of homozygosity and heterozygosity in relation to high and low chromosome numbers, chromosome pairing, genetic structure of populations, gene flow and divergence, population genetics of dispersal and colonization, allopolyploids, Antheridiogens, different hormones, fertilization mechanism, sex determination, development of sex organs (both under natural and experimental conditions), modern molecular researches on fern plastid genomes and nuclear genome, are described.

Part III contains four chapters related to ecology. In 'Phenology and habitat specificity of tropical ferns', Klaus Mehlreter focuses on effects of various environmental factors on adaptation, distribution, habitat specificity and phenology of different growth forms or ecological types of ferns and lycophytes. In 'Gametophyte ecology', Donald R. Farrar and others cover all the aspects of gametophyte ecology including different types of gametophytes, factors controlling the growth and development of gametophytes and sex organs, morphology, physiology, water relations, etc. In the next two chapters, 'Conservation biology' and 'Ex-situ conservation of ferns and lycophytes – approaches and techniques', different types of global threats to ferns and allied plants, their *in-situ* and *ex-situ* conservation methods, are highlighted along with their role in enhancement of habitat and healthy ecosystems.

In the last part, Christopher H. Haufler describes species concepts of ferns, asexual and cryptic species, boundaries among species and process and types of speciation in Pteridophytes. In the next chapter, G. W. Rothwell and R. A. Stockey explain the phylogeny, diversification and radiations in ferns with the help of available palaeontological data of different geological periods. Global and regional Pteridophytic diversity, long distance dispersal, vicariance and biogeography are described by R. C. Moran. Latitudinal diversity gradient, species richness in tropical parts, patterns of species richness in mountain systems, mid elevation bulge, etc., are interesting parts of the chapter. Eric Schuettpelz and K. M. Pryer describe the divergence of early vascular

plants and other groups of ferns with the help of molecular phylogenetic analyses and cladograms based on the earlier work of one of the authors in the *Tree of Life*. The last chapter is an updated version of fern classification, published in *Taxon* (2006). The accepted families and genera are listed in two appendices.

Inclusion of whisk ferns and horsetails within ferns and nearness of filmy ferns with Osmundaceae (chapters 15 and 16), though based on molecular analyses, is difficult to accept from the morphology point of view. We wish to call the attention of present-day phylogeneticists (whose inferences are based entirely on molecular evidences) to Bierhorst (*Phytomorphology*, 1968, 233), who had placed *Psilotum* (a whisk fern) in filicales (ferns), entirely based on morphology. The senior morphologists and phylogeneticists not only rejected his contentions but summoned a symposium to tell him finally: 'you can bring *Selaginella* into the Marattiaceae, or *Equisetum* into the Ophioglossaceae. You can do it, but it does not make any sense.' (*Brittonia*, 29, 1977). Morphology will become peripheral if we surrender to technology. Accepting a middle path between morphology and moleculology may yield better results as also advocated by Fraser-Jenkins (*Indian Fern J.*, 2009, 107).

The classification and phylogeny as given in the book can be introduced in the academic curricula where only extant forms are included in the syllabi but where fossil forms are included in the curricula, for instance in the Indian universities, these cannot fulfil the requirement. We cannot and should not accept omission of palaeobotanical studies because this discipline has maintained the international status and the only institute in the world is exclusively nurturing this branch of botany in India. In this situation the Rothwell and Stockey concept (chapter 13) should also be considered. This book will be useful for the students of botany, researchers and university teachers.

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