PREFACE

The plant physiology and plant molecular biology research community has evidently endorsed the new directions taken by the treatise, accounting for the steady ability of ***Advances in Plant Physiology*** to attract the pre-eminent scientists in plant biology. Certainly, the configuration of *Volume 9* of the ***International Treatise Series*** has been done absolutely due to commendable contributions from World Scientists of eminence in unambiguous fields. I am delighted to declare that within the time span of nine years, now this treatise has been duly recognized through ISI Web of Knowledge – *Current Contents* in the hearts of distinguished readers and has beyond doubt achieved the international status. I once again reiterate that this programme has been undertaken with a view to reinforce the identical efforts to recognize the outcome of meticulous research in some of the very sensible and stirring areas of ***Plant Physiology-Biochemistry-Plant Molecular Physiology/Biology.*** In order to sustain and further advance *Plant Physiology*, I am dedicated to continue the originality and the introduction of spanking new ideas, ensure that the treatise welcomes the best science done across the full extent of modern plant biology, in general, and plant physiology, in particular, persevere on advancing the quality of what is published, place high value on the quality of production, and be highly attentive and responsive to the rapidly changing face of academic publishing. The new initiatives that I have in mind to further advance *Plant Physiology Treatise Series* come out from my faith that the treatise would substantially benefit by becoming more positive about illustrating the significance of the science that we bring out.

Indeed, our objective is to publish innovative science of the highest quality across the broad disciplinary scope of the treatise. In our Instructions for Authors, we state that work reported in international journals/ treatises including the ***Advances in Plant Physiology Series*** should be strongly executed, provide new information, and move the field to the next level.

The high visibility and influence of review articles published in *Advances in Plant Physiology* offer the opportunity to further broaden the disciplinary arena in which the treatise receives high-calibre submissions. For example, *Advances in Plant Physiology* offers the opportunity for high-calibre reviews in environmental, evolutionary, and agricultural plant biology to be published in a treatise series with higher impact and greater penetration than would otherwise be possible in more specialized disciplinary publications. In conclusion, I hearten you to share your suggestions and criticisms about what we are doing and how we are doing it with me; they may not always result in a change, but all vital suggestions will be given serious thought.

In *Volume 9,* with inventive applied research, attempts have been made to bring together much needed **twenty review articles** by Forty-six contributors

from Australia, Belgium, France, Germany, India, Italy and Spain dispersed in *Nine Sections* as described below:

Since plants frequently encounter stresses when exposed to different environments and adversely affect growth, development, or productivity of plants in manifold ways, utmost research emphases in this important area have been put down at the global scale and, therefore, The first and foremost *Section I* necessarily allocates ten vital chapters related to *Molecular Physiology of Plants under Environmental Stresses: Tolerance Mechanism and Responses.* In ***Chapter 1***, veteran Spanish scientists summarize the role of hydrogen peroxide (H_2O_2) in the regulation of plant responses to the interaction between drought and oxidative stress. Drought stress is a complex syndrome involving not only water deprivation, but also nutrient limitation and salinity and may upset the balance between antioxidant defences and the amount of reactive oxygen species (ROS), resulting in oxidative stress. The review in ***Chapter 2*** aims to discuss various changes occurring in plants at physiological and molecular levels under conditions of drought besides covering various responses of vital living processes to drought and development of tolerance. An eminent Australian Scientist in ***Chapter 3*** has given an account of the increasing understanding of the Ca^{2+} signatures which are proposed to encode the specificity of the ozone-induced response, and in so doing, lead to the appropriate downstream response. Besides this, the chemistry behind the "natural" production of reactive oxygen species during "normal" photosynthetic and respiratory processes has been briefly summarised and the various mitigating defence mechanisms of the plant outlined. ***Chapter 4*** has been adequately dealt with physiological, biochemical and growth responses of plants to tropospheric ozone by an excellent team from the Banaras Hindu University, India.

In spite of the rapid pace made in the past years into the understanding of reactive oxygen species and the mechanisms of their detoxification, a lot of questions and gaps remain in our understanding of how these affect stress response in plants. Superoxide dismutase (SOD) catalyzes the destruction of the O_2^- free radical and thus protects oxygen-metabolizing cells against the harmful effects of superoxide free radicals. An interesting review with similar aim has been illustrated in ***Chapter 5.*** Subsequently in ***Chapter 6,*** exclusive details of salt stress adaptations of mangroves, their physiological and molecular biological aspects including genetics of mangroves have been dealt comprehensively by a team of illustrious workers of high stature who have no doubt largely contributed their original laboratory work taken up to study the general physiology of stress and possible adaptive features of tree mangroves. Indeed, this extensive and amazingly productive review very reasonably enriches the *Volume 9* for that the three Indian authors are especially congratulated. Similarly, coconut palm responds to the stress conditions at morphological, anatomical, physiological and biochemical levels. The atmospheric stress influences the photosynthetic rates and if prolonged with soil moisture stress, dry matter production and its partitioning are influenced. Consequently, a very demanding review on adaptive strategies of coconut palm under stressful conditions has been extensively written in ***Chapter 7*** where experienced authors from the Central Plantation Crops Research Institute, Kasaragod have suggested that since coconut responds to the stressful environments at morphological, anatomical, physiological and biochemical levels,

attention should be given to develop the molecular markers linked to desirable traits and to understand the inheritance patterns of these traits. The genotypes with desirable traits for tolerance to stress conditions can be used in breeding strategies for abiotic stress tolerance in future crop improvement strategies.

It is important to develop transgenic plants that can accumulate metals for phytoremedation of metal polluted environment. With this view, the molecular physiology of heavy metal stress in plants has been interestingly well illustrated in ***Chapter 8*** by renowned Indian and Japanese scientists. The review presented in ***Chapter 9*** summarises the progress of heavy metal research using duckweeds during the past few years primarily since 1997. Remarkably duckweeds take up mineral elements as well as heavy metals and other (partially toxic) compounds – as long as the extent of the toxic effects does not prevent further vegetative growth of the plants. In ***Chapter 10***, a very young scientist from India has exceptionally endeavoured to overview jasmonic acid as a stress relieving plant cell signaling molecule. After that, in the *Section II*, two renowned scientists from Italy concentrate primarily on recent advances in the biosynthesis and functions of cuticular waxes, with emphasis on *Arabidopsis* and maize in ***Chapter 11***. An update on recently identified endoproteolytic processes in chloroplasts and plant mitochondria has been wonderfully consolidated by three eminent German workers in ***Chapter 12*** of the *Section III*. Next to these, in ***Chapter 13*** of the *Section IV*, two dedicated Japanese workers have very scientifically discussed predominantly their own experiences with regard to identification of rice root proteins regulated by gibberellin using proteome analysis. The *Section V* on *Crop Modeling* consists of highly needed review on crop simulation modelling and its implications and potentials for rubber, which has been included for the first time in this *International Treatise Series* from India as ***Chapter 14.*** The important review in the *Section VI* as ***Chapter 15*** superbly written by nine distinguished and authoritative French scientists discusses the early steps necessary to establish symbiosis, from the recognition mechanisms between rhizobacteria and their host plants, to the cellular and morphological events in different root tissues associated with nodule primordium formation. The *Section VII* on *Molecular Basis of Metabolism* consists of two outstanding reviews as ***Chapter 16*** and ***17,*** which focus on the enzymes catalyzing fructan breakdown in plants: fructan exohydrolases on the one hand and strong auxin like activity of 4-chloroindole-3-acetic acid (4-Cl-IAA) in different bioassays besides its well established role in plant growth on the other hand respectively. Subsequently in *Section VIII* related to *Crop Physiology and Biochemistry,* attempt has been made in ***Chapter 18*** to review the researches pertaining to role played by diverse physiological parameters in grain growth and development and the relationship that exists between the yield of grains by a very dedicated and veteran Indian Plant Physiologist. Out of two essential chapters in *Section IX* especially dealing with *Post-Harvest Physiology* and new to this *Treatise Series,* ***Chapter 19*** summarizes that recalcitrant seeds should be kept at moisture contents above their lowest-safe values and ventilation is needed to remove toxic gases and to prevent anoxia. However further research is needed for prolonging the life of these seeds. Eventually, in ***Chapter 20,*** a very thoughtful and distinguished scientist from Division of Biotechnology, Institute of Himalayan Bioresource Technology, aimed to review the changes in plant growth substances especially

auxins, gibberellins, cytokinins, abscisic acid and ethylene during ripening and post harvest periods in fruits. Altogether, ***Volume 9*** is a vast wealth of applicable knowledge in the field of biological sciences.

In this dedicated endeavour, I am overjoyed to state my authentic appreciation to all distinguished and talented ***Members of the Advisory Committee***, for bringing up this unsurpassed, realistic, thoughtful and far-reaching treatise up to the international standard. In addition, I am extremely grateful to the ***Fellow Members of the Indian Society for Plant Physiology, New Delhi*** for their trustworthy moral support and valued suggestions from tin.e to time. My esteem is very much due to the Hon'ble Vice-Chancellor Prof. Panjab Singh, Banaras Hindu University, the Director, Institute of Agricultural Sciences Prof.Shiv Raj Singh, the Dean, Faculty of Agriculture Prof. Janardan Singh, and my admired colleagues of the Banaras Hindu University and other universities and institutes of the world for their consistent moral support in this gigantic task. Besides these, I have my sincere thanks to Mr. A. Ishan Rahul, N.T.S.E. *Fellow* (Govt. of India) and student of National Institute of Technology, for his incredible perfectionism in the conception of the very sensible and exceptional cover page of this *Volume*.

Last but not the least, I am indebted to my affectionate mother and my all family members for their blessings and good wishes in this wide mission. I have my profound esteem to all of them. Besides these, I am extremely thankful to the outstanding staff members of the Scientific Publishers, Jodhpur, India, for their genuine competence in the perfect printing and worldwide circulation of this treatise. Above all, I supremely recall that this undertaking is in advance dedicated to the adoring memory of my revered father Late Dr. A. Chittaranjan Sahay.

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