ECOPHYSIOLOGY OF HIGH SALINITY TOLERANT PLANTS

Tasks for Vegetation Science 40

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Ecophysiology of High Salinity Tolerant Plants

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Dedication of this volume

We wish to dedicate this volume to the many scientists who are involved in the research of high saline tolerant plants. It is through their effort that our knowledge of the mechanisms of saline tolerance is being understood. They are the ones who find high saline tolerant plants and evaluate their possible value in reclamation and economic use.

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Preface

The halophytes are highly specialized plants, which have greater tolerance to salt. They can germinate, grow and reproduce successfully in saline areas which would cause the death of regular plants. Most halophytic species are found in salt marsh systems along seashores or around landlocked inland lakes and flat plains with high evaporation. The halophytes play very significant role in the saline areas specially in the coast by overcoming the salinity in different ways, viz. with regulating mechanisms in which excess salts are excreted and with out regulating mechanism, which may include succulents or cumulative types. Besides that they protect coast from erosion and cyclones, provide feeding ground and nursery for fish, shrimps and birds. Halophytes get increasing attention today because of the steady increase of the salinity in irrigation systems in the arid and semi-arid regions where the increasing population reaches the limits of freshwater availability. In many countries, halophytes have been successfully grown on saline wasteland to provide animal fodder and have the potential for rehabilitation and even reclamation of these sites. The value of certain salt-tolerant grass species has been recognized by their incorporation in pasture improvement programs in many salt affected regions throughout the world. There have been recent advances in selecting species with high biomass and protein levels in combination with their ability to survive a wide range of environmental conditions, including salinity.

Our limited understanding of how halophytes work, as this may well be our future as our limit of fresh water is reached. It is important that we preserve these unusual plants and their habitats, not just for their aesthetic beauty, but also as a resource for the development of new salt tolerant and halophyte crop of economic importance. Over the last ten years much new information has become available about the genetics, molecular biology, ecology, physiology, and physiological ecology of high salinity tolerant plants. A binational US-Pakistan workshop with the support of National Science Foundation, USA was organized in Brigham Young University, Provo, Utah to discuss the currents trends on High Salinity Tolerant Plants. This volume was put together primarily based on the presentations made in that meeting. However, papers were also invited from those who were unable to attend the workshop due to unavoidable circumstances and other imminent halophyte biologists.

This volume is a good collection of papers on the halophytes. Effect of soil salinity in combination of other soil factors were discussed by Barrett Gaylord, Todd Egan, Ajmal Khan, Bilquees Gul and group from Tunis led by Prof. Chedly Abdelly. These papers discussed various germination strategies employed by halophytes to be successful and the role of calcium in promoting seed germination under saline conditions. Salt tolerance of halophytes during the mature vegetative stage were discussed by a group from University of Agriculture Faisalabad, Pakistan lead by Prof. M. Ashraf, Prof. Xiaojing from Shijiazhuang, China, Jack Gallagher from USA, Yasin Ashraf, from Nuclear Institute for Agriculture and Biology, Pakistan. They indicated there are plants which can survive on salt concentration approaching seawater and produced considerable biomass. Dr. Lee Hansen has been instrumental in developing the calorimetric responses to determine the level of stress in plants and have another excellent paper to indicate the efficacy of the techniques used. There are several contributions dealing with the physiology of salt tolerant shrubs and grasses and the mechanism of the salt tolerance.

Halophytic vegetation of the most regions is poorly understood. There are several contributions describing the halophytic vegetation of Great Basin Utah, Saudi Arabia etc. Several papers were included on economic utilization of halophytes. Nick Yensen and Michael DePew are the leading name for successful utilization of halophytes as grain crop, turf and forage in the highly saline areas and have made a significant contribution in introducing this technology from laboratory stage to a profit making enterprise. Similarly US Salinity Laboratory has added a new dimension in saline agriculture by growing floriculture crops. Nick Yensen and Benno Böer look ahead in the 21st century and the necessity for the halophytic research, its potential and possible contribution in the world with limited supply of fresh water.

We wish to acknowledge the support provided by the National Science Foundation (Grant no. NSF INT-0220495) that made it possible to hold the High Saline Tolerant Plants Symposium in Provo, Utah. We appreciated the support and co-operation of Brigham Young University in providing services in connection with the symposium. We especially want to express gratitude to Dr. W.M. Hess who was involved with the planning of the symposium. We would also like to thank Mr. Zaheer Ahmed for his invaluable contribution in editing and making it camera ready for the publication.

Foreword

Volume 40 of the T:VS series, edited by Professors Khan and Weber comes as a present for the 25th birthday of the series. With many other volumes of the series, it deals with problems of saline ecosystems and halophytes. Both editors are long time experts in that field. They were able to attract many other experts in salinity research to present interesting papers from various aspects of saline systems.

Several volumes in this series have made it possible to include papers from colleagues working in developing countries. This is also the case in this volume. While this brought some criticism about problems with the English language, I am still convinced that we should continue the inclusion of such papers from otherwise neglected areas. We realize that this will be criticized, but under the present financial constraints it is not possible to obtain the editorial help for a better presentation. All who were involved in discussions, reviewing and editing, helped to make the contents of the papers as clear as possible. First priority, however, remained the scientific value of the papers, which is sometimes difficult to detect, because the research priority and level varies to some extent in the countries from where papers are included. This book, like several others before in the series, is a good example for our efforts.

This volume contains papers ranging from seed physiology to presentations of new concepts to understand saline systems. In between are papers dealing with the present level of ecophysiological work and the description of halophytic species present in regions of interest. The latter is very welcome in the context of this book series, because we have several papers on that topic and may soon approach a complete picture of halophyte species diversity from the entire world.

With regards to the contributors of this volume, it is rewarding for the series editor to see that many papers come from colleagues with which I have had contacts for a long time. It is a pleasure for me to help them publish their research work here and in the future. I hope that the two volume editors and the book as a whole receive the attention in the scientific community that they deserve.

I thank the Publisher for the continued interest in the series and hope that it gains similar standing in the new Springer environment as it had in the previous Kluwer publishing house.

Helmut Lieth
Osnabrück, July 2005