

BOOK REVIEWS

Crop Production in Saline Environments.

Sham S. Goyal, Surinder K. Sharma and D. W. Rains (eds). Food Products Press, an imprint of the Haworth Press, 10 Alice Street, Binghamton, New York 13904-1580. 2002. 452 pp. \$ 59.95.

In a recent review by Wang, Vincour and Altman (*Planta*, 26 September 2003), the importance of studying abiotic stresses in plants has been clearly emphasized. Many plants have evolved to cope with environmental stresses, both biotic – pathogens and insects, and abiotic – drought heat, cold and salinity. However, majority of currently grown varieties of important crop plants are unable to thrive in one or the other abiotic stress condition. These stresses pose a heavy threat to agriculture.

This book deals in detail about one of the abiotic stresses, the salinity. As the subtitle suggests, it is an in-depth account of global and integrative perspectives on this subject. Due to irrigation, traces of salt are left in the soil which gradually accumulate and make the farmland infertile. Twenty five million acres of land are lost to salinity each year. According to FAO, salinization of arable land will result in 30% land loss in the next 25 years and up to 50% by the year 2050, if corrective measures are not taken. 'The challenge for the next 3–4 decades will not only be to feed additional three billion people but to do so without converting much of the world's prime habitat into second and third rate farm land' or without converting forest areas into farmlands. It is therefore essential to tackle this problem of salinity from various angles and from this point of view this book is very timely. The editors of this book have themselves been involved in this area of research activity for a number of years and the authors of different chapters have also been well selected.

Rains and Goyal have dealt with broad strategies for the management of crop plants in saline conditions in great depth. It is suggested that one has to manage soil salinity problem on one hand and at the same time use classical and modern genetic tools to enhance the protective responses of crop plants. The strategy of soil management is discussed by Gratten and Oster in view of their experience in using saline sodic water in San Joaquin

Valley of California. They suggest that the use of other trace elements like B, Se, and Mo may influence the use of such water for irrigation. They also bring out the use of computer models that will throw light on the relationships among irrigation amount, soil solution composition and salt load of drainage waters, salinity effect on yield and deep percolation. Accordingly appropriate crops need to be selected for such soil and irrigation conditions. Management of saline soils and how to reclaim salt affected soils have been dealt with respect to the areas in China, by Yuanchun. In China systems for monitoring and predicting the regional water and salt have been developed and accordingly management practices have been implemented which have yielded good dividends in terms of increase in cumulative grain output. In India, there are about 24.5 million hectares of wasteland having organic matter up to only 0.3–0.5% and are highly deficient in micronutrients. Of these, about 8.6 million hectares is salt-affected soil. Using hydrochemical technology, described by Minhas and Sharma in their chapter, and fertilizer input management, lot of land has been reclaimed for cultivation. In a similar context, Singh and Kelleners have described the use of models in regulating pumping schedule for changing the water quality for irrigation in a specific area in Punjab. Like in North India, Swarajyalakshmi *et al.* have shown that salinity is affecting large areas in South India resulting in decrease in productivity of agricultural and horticultural plants. They emphasize the need for soil and nutrient management along with selection of salt-tolerant varieties for proper use of such areas for crop production. In India a number of groups have been working to obtain novel genotypes through selection and breeding for cultivation under saline environment. Sharma and Goyal have described their own and others' experience in developing such lines in India and other laboratories around the world.

Besides China and India, the book also describes the situation in other countries like, Pakistan (Qureshi *et al.*), North Africa (Abou-Hadid), Australia (Khan *et al.*), Siberia (Bykovskaya and Malinina) and California (Ayars). Each area has its own specific soil conditions and availability of plant materials and accordingly different solutions have to be found. It is in

this respect that the book is global in its presentation of the problem of salinity and gives a very broad perspective of the overall scenario.

Though drainage, irrigation, chemical inputs, and other forms of soil and water management practices have been used, the successes have not been proportionate to the efforts. Moreover many of these methods are not always economical. On the other hand, attempts have also been made to develop salinity-tolerant plants by crossing and selection. This approach has also been only partly successful. There is a kind of an inverse relationship between stress tolerance and yield. It has been emphasized that in order to get fruitful results, one will have to understand at the molecular level the basis of stress tolerance and sensitivity. Accordingly, genomic tools are now being used to analyse the genes that are regulated in response to salinity stress in different plants. In fact using mutational approach, novel pathway, SOS (salt overlay sensitive) has been implicated in salinity signalling involving calcium-binding proteins and kinases. These approaches and work done so far have been described in details by Bennett and Khush, Maggio *et al.*, and Santa-Maria. These studies have identified some of the potential genes which were over expressed in transgenic systems to develop saline-tolerant plants.

To conclude, this book has covered all aspects of salinity problems, and methods to overcome them. It also describes the attempts to identify saline-tolerant plants, and develop new varieties using classical methods and molecular genetic approaches and genetic engineering technology. I reiterate what Swaminathan has mentioned, 'I hope this book will be read widely and used for promoting soil health and sustainable advances in crop production'. I also hope that funding agencies in India will encourage more research activities in this important area of abiotic stresses in plants for utilization of wastelands in this country.

S. K. SOPORY

*International Centre for Genetic
Engineering and Biotechnology,
Aruna Asaf Ali Road,
New Delhi 110 067, India
e-mail: sopory@icgeb.res.in*
