BOOK REVIEW

Drought Tolerance in Winter Cereals (Proceedings of an International Workshop 27–31 October 1985, Capri, Italy), Edited by J. P. Srivastava, E. Poreedu, E. Acevedo and S. Varma (Published by John Wiley and Sons, Baffins Lane, West Sussex, England-PO19 1UD), pp. 387, Price £25.50.

This book is a compilation of the 29 presentations made by a multidisciplinary group of scientists at the international symposium 'Improving winter cereals in moisture-limiting areas' held in Capri, Italy, from 27 to 31 October 1985. The symposium was attended by agrometeorologists, soil scientists, plant physiologists and breeders with the single objective of applying their knowledge towards enhancing yields in water-limited environments. The book has four sections. Section I—The framework for winter cereals research in the low-rainfall areas of South-West Asia and the Mediterranean—deals with the role of agroclimatology and of agroecological models in developing a meaningful approach to crop improvement. Section II—Breeding for winter cereals in the low-rainfall areas—reviews and compares the efficiency of current breeding methods and presents some new approaches. Section III deals with physiological research for drought avoidance and tolerance and its implications in breeding programmes, and Section IV deals with plant characteristics required for improved performance in moisture-limiting environments. A set of recommendations of the symposium is also included.

Crop productivity is an expression of the genetic potential in a particular environment. Considerable progress has been made in the productivity of cereals in the past few decades in non-limiting environments. This has been achieved by breeding high-yielding varieties responsive to both fertilizer and irrigation. In stressful environments yield gains have been very modest. The major environmental stress limiting crop productivity is water stress. It is often coupled with other abiotic stresses that accentuate the effect of water stress, making productivity low and unstable.

The major objective of the International Centre for Agricultural Research in Dry Areas (ICARDA), Aleppo, Syria, is to improve yields of winter cereals in the dry areas of West Asia and North Africa. The environment of the Mediterranean is characterized by low and variable winter rainfall, which leads to a high probability of early and terminal drought stress. In certain areas low temperatures prevail during canopy development while high temperatures occur during grain filling. Improving and stabilizing yield in environments characterized by multiple stresses is a difficult task. Breeding for stress tolerance coupled with appropriate agronomic management is one of the approaches being followed.

Breeding for stress tolerance has been done in the past following the empirical approach of selecting for high yield. The second and more recent approach, which has been introduced for areas where stresses are of high intensity, is the analytical approach. This approach relies on the basic assumption that breeding and selection for adaptation mechanisms of a plant in a stressful environment will contribute to growth and yield under stress and will not decrease yield in better environments. The advantages and the limitations of both the empirical and the analytical approach in breeding for increased yield and stability in drought-prone environments were brought out in the presentations by Srivastava, Marshall, Hadjichristodoulou, Stanca and others. There is a growing realization among breeders that breeding should be for specific environmental conditions and crop seasons available in different target areas. The choice of right parents is crucial.

The success of the analytical approach depends on the identification of traits that provide an advantage in dry areas. The combination of such characters constitutes a plant idiotype suitable for a given agroecological condition or environment. The process of developing plant idiotypes requires the active cooperation of agronomists, plant physiologists and biochemists. Attempts to define plant idiotypes suitable for the different dry areas were made by Castringnano, Duwayri, Ceccarelli, Acevedo, Austin and others. Crop simulation models are being used extensively to verify the suitability of a character in a particular environment. This methodology expedites the process of idiotype formulation and suggests the future course of research as the predictions made have to be verified experimentally.

The symposium laid considerable emphasis on the use of physiological basis in crop improvement programmes, specially in stressful environments. Breeding for a plant idiotype specific for an agroecological zone is an outcome of this approach. Hence defining an agroecological zone is the first priority. This was amply emphasized by Frere *et al.* and Miglietta *et al.* Knowledge of the potential productivity of the zone sets the yield limits for the breeders. Breeding for an idiotype in which crop phenology matches the target environment and is associated with drought-resistant traits becomes the aim of plant breeders. Information on the heritability and stability of the physiological characters important for stress tolerance is very meagre and more must be generated. Collaborative effort is required from plant physiologists and breeders in developing quick and reliable screening methods for key physiological and biochemical traits that breeders can use in screening large segregating populations.

In conclusion this symposium has highlighted the fact that plant breeders will need active support of meteorologists, physiologists, biochemists and soil scientists to achieve the goal of improving and stabilizing productivity in stress-prone environments. By highlighting the deficiencies in knowledge in various disciplines this book will serve as a catalyst for research in the area of breeding for resistance to environmental stresses. With its well-written chapters and up-to-date references the book will be an excellent addition to all libraries catering to researchers and post-graduate education.

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SUMMARY OF ANNUAL REPORT (1987) OF THE INTERNATIONAL RICE RESEARCH INSTITUTE, MANILA, THE PHILIPPINES

Published by IRRI, Manila, The Philippines, 1988, pp. 640

The research activities of the Institute are presented under the following heads: Genetic evaluation and utilization (GEU) programme (pp. 1–218); Management of rice pests (pp. 219–286); Water management (pp. 287–302); Soil and crop management (pp. 303–414); Climatic environment and rice (pp. 415–419); Consequence of new technology (pp. 420–429); Crop systems programme (pp. 430–505); Machinery development and testing (pp. 506–515); Training programme (516–536); and International collaboration (pp. 537–614). There are also chapters on research support services, publications, seminars, finances and weather summary.

Work on abscisic acid (ABA) and drought resistance in 60 upland rice genotypes and nine species of *Oryza* grown in controlled environmental cabinets is presented. ABA was assayed by radioimmunoassay. A five-fold difference in drought-induced ABA accumulation among the 60 genotypes and a two-fold difference among the nine species was found. Perhaps there is a possibility of increasing or decreasing ABA levels of rice cultivars through breeding and selection. Under field conditions stomatal conductance and growth appeared to be more sensitive to water deficit than did leaf ABA levels.

Zinc content *per se* may not be important in varietal screening. It would appear that the nutrient balance particularly, Fe/Zn imbalance, can induce zinc deficiency. This emphasizes the importance of nutrient balance in the study on nutrient deficiencies or toxicities and underscores the usefulness of nutrient ratios as an adjunct to visual scoring in varietal screening tests for micronutrient deficiency.

A detached-leaf technique was used to assess sheath blight infection on different species of *Oryza*. Leaves were detached and inoculated with discs of potato dextrose agar containing the mycelium of a three-day-old culture of *Rhizoctonia solani*. The leaves were then placed under moist conditions and incubated at 27°C.

Through genetic analysis IRRI has identified a buff-pigment mutant that acts epistatically to virulence in the blast fungus. The buff gene controls melanin synthesis, which is essential for successful penetration of host cells. Buff mutants cannot infect rice even though they have the right combination of virulence genes.

Due to problems in obtaining a reliable supply of ^{32}P radioactive nucleotides IRRI explored the use of a non-radioactive labelling technique with biotinylated