## CONTENTS

## SECTION I. INTRODUCTION

The potential effects of climate change on world food supply <i>M.L. Parry and C. Rosenzweig</i>	1
Manifestations of mechanical stress in membranes: A prospective hypothesis of endogenous expression of exogenous stress signalling	27
Y.Y. Leshem, R.R. Avtalion, R. Agassi, H. Gottleib and D. Bach	

## SECTION II. ATMOSPHERIC POLLUTION

Significance of increasing ambient $CO_2$ for plant growth and survival, and interactions with air pollution <i>H.Z. Enoch and S.J. Honour</i>	51
Ozone, sulphur dioxide and nitrogen oxides: Some effects on the water relations of herbaceous plants and trees	77
T.A. Mansfield, M. Pearson, C.J. Atkinson and P.A. Wookey	
Ozone/sulphur dioxide interactions in temperate arable crops V.J. Black, J.J. Colls and C.R. Black	89
Predisposition to stress following exposure to air pollution A.W. Davison and J.D. Barnes	111
Influence of nitrogenous air pollutants on carbon dioxide and ozone effects on vegetation L. van der Eerden, A. Tonneijck, W. Jarosz,	125
S. Bestebroer and T. Dueck	

Impact of air pollutants on plants in hot, dry climates G. Schenone	139
The molecular biology of plants exposed to ultraviolet-B radiation and the interaction with other stresses B.R. Jordan	153
The assessment of plant damage by reactive hydrocarbons and their oxidation products <i>G.M. Terry and N.J. Stokes</i>	171
Too much of a good thing? Long-term exposure to elevated $CO_2$ decreases carboxylating and photorespiratory enzymes and increases respiratory enzyme activity in Spruce J-J. Van Oosten, P. Dizengremel, E. Laitat and R. Impens	185
SECTION III. FLOODING AND SUBMERGENCE	
Climatic change and wetland vegetation in Northern Europe R.M.M. Crawford	197
Response of coastal vegetation to flooding and salinity: a case study in the rapidly subsiding Mississippi River deltaic plain, USA <i>R.D. DeLaune, S.R. Pezeshki and W.H. Patrick Jr.</i>	211
Flood tolerant and flood sensitive plants under primary and secondary anoxia B.B. Vartapetian	231
Responses to total submergence in tolerant and intolerant riverside species C.W.P.M. Blom, L.A.C.J. Voesenek and A.J.M. van der Sman	243
Inorganic carbon assimilation and growth of aquatic macrophytes T. V. Madsen	267
A microelectrode study of oxygen distribution in the roots of intact maize seedlings W. Armstrong, S. Cringle, M. Brown and H. Greenway	287
Long term survival of rhizomatous species under oxygen deprivation T. Henzi and R. Brändle	305

Promotion of stem extension in an aquatic monocot ( <i>Potamogeton pectinatus</i> L.) by the complete absence of oxygen, and by partial oxygen shortage	315
J.E. Summers and M.B. Jackson	
Metabolic acclimation to anoxic conditions and biochemical basis of death P. Saglio	327
Energy and fermentation metabolism in hypoxic rice coleoptiles – a multinuclear NMR approach <i>T.W-M. Fan, A.N. Lane and R.M. Higashi</i>	333
Endogenous phytohormones and germination of rice under anoxia: indoleacetic acid and abscisic acid S. Mapelli and A. Bertani	353
Preliminary evidence of nitrate assimilation during the anaerobic germination of rice M. Mattana, A. Bertani, N. Aurisano and R. Reggiani	365
Molecular genetic basis of metabolic adaptation to anoxia in maize and its possible utility for improving tolerance of crops to soil waterlogging <i>M.M. Sachs</i>	375
Metabolic acclimation in winter cereals by interacting low temperature stresses <i>C.J. Andrews</i>	395
Metabolic and cellular impact of ice encasement on herbage plants <i>B.E. Gudleifsson</i>	407
Responses of nodulated legumes to oxygen deficiency C. Arrese-Igor, M. Royuela and P.M. Aparicio-Tejo	423
SECTION IV. DROUGHT	

Effects of drought and elevated CO <sub>2</sub> on plant water use	
efficiency and productivity	435
T.C. Hsiao	

Water relations in controlled environments and the field J.W. Radin	467
The physiology of survival at the limits of farming in the dry tropics G.R. Squire	485
Plant water stress under low rainfall, high temperature summer conditions in Portugal <i>M.T. Oliveira</i>	497
Identification of stress tolerance traits in sugar beet N. Clarke, H. Hetschkun, C. Jones, E. Boswell and H. Marfaing	511
Stomatal responses to abscisic acid in natural environments W. Hartung and H. Heilmeier	525
ABA and the control of growth and physiology of stressed plants W.J. Davies, C.L. Trejo and S.J. Palmer	543
Regulation of root growth at low water potentials R.E. Sharp, E.S. Ober and Y. Wu	557
Stress-enhanced metabolism of abscisic acid J.A.D. Zeevaart	573
Molecular biological responses to drought in maize M. Pagès, J. Vilardell, A.B. Jensen, M <sup>a</sup> Mar Albà, M. Torrent and A. Goday	583
Replacement of glycine betaine by ß-alanine betaine, choline-O-sulphate or dimethylsulphoniopropionate in plants adapted to interacting stresses A.D. Hanson and B. Rathinasabapathi	593
Wall extensibility and the growth of salt stressed leaves <i>P.M. Neumann</i>	603
Growth and composition of nitrogen and water stressed pepper plants, their assessment by remote sensing and their herbivory effects J. Peñuelas, C. Biel, M. Estiarte, I. Filella, R. Matamala, L. Serrano and R. Savé	617

Screening methods for determining drought resistance in barley S. Nogués and L. Alegre	633
SECTION V. COLD	
Low temperature induced biochemical mechanisms: implications for cold acclimation and de-acclimation C. Stushnoff, R.L. Remmele Jr., V. Essensee and M. McNeil	647
Molecular mechanisms of freeze-thaw injury and cold acclimation in herbaceous plants: merging physiological and genetic approaches J.P. Palta, L.S. Weiss, J.F. Harbage, J.B. Bamberg and J.M. Stone	659
Molecular biology of cold tolerance R.S. Pearce, M.A. Dunn and M.A. Hughes	681
Redesigning crops for increased tolerance to freezing stress P.L. Steponkus, M. Uemura and M.S. Webb	697
The molecular mechanism of the low-temperature tolerance of plants studied by gene technology of membrane lipids <i>N. Murata, H. Wada, Z. Gombos and I. Nishida</i>	715
Aspects of the cellular and molecular basis of cold tolerance in plants A.M. Boudet, M. Cabané, N. Leborgne and C. Teulières	725
SECTION VI. REPORTS OF WORKING GROUPS	
Atmospheric Pollution Working Group J.D. Barnes, C. Biel, C.R. Black, V.J. Black, L. van der Eerden, H.Z. Enoch, A.M. Farmer, B.R. Jordan, T.A. Mansfield, S.Nogués, J.J. van Oosten, G. Schenone and G. Terry.	743

Flooding and Submergence Working Group	749
M.B. Jackson, C.J. Andrews, R.M. Brändle,	
R.M.M. Crawford, T.W-M. Fan, S. Mappelli,	
M. Mattana, W.H. Patrick Jr., M.M. Sachs,	
P.H.M. Saglio, J.E. Summers, B.B. Vartapetian	
and L.A.C.J. Voesenek.	
Drought Stress Working Group	753
J.A.D. Zeevaart, W.J. Davies, W. Hartung,	
T.C. Hsiao, A.D. Hanson, T. Jesko, J.W. Radin,	
M. Pagès, R.E. Sharp and G.R. Squire.	
Cold Stress Working Group	755
C. Stushnoff, A. Boudet, B.E. Gudleifsson,	
Y. Leshem, N. Murata, J.P. Palta, R.S. Pearce	
and P.L. Steponkus.	

## SUBJECT INDEX

757