Soil Conditions and Plant Growth

TENTH EDITION

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Preface to tenth edition

The importance of the inter-relations between soil and plant in determining plant growth is now so well accepted that very large resources all over the world are devoted to their study, with the consequence that rapid advances are being made in our understanding of them. These advances render the text of the previous edition of this book sufficiently out-of-date to necessitate a complete re-writing of most sections, to allow a proper discussion of the ideas and theories that are currently receiving most attention. It is also gratifying to see how rapidly the concepts of present-day physics and chemistry are being used to give an exact quantitative understanding of many factors relevant in soil–plant inter-relations, but these applications often require advanced mathematical techniques which are difficult for research workers unfamiliar with them to understand. I have attempted to give as accurate a description as I can of the physical and physico-chemical properties used in these studies, but have usually omitted any discussion of the basic mathematical techniques needed to obtain the final quantitative results.

One of the functions of this book has been to give a critical account of our present knowledge of the topics discussed, so wherever possible references are given for all the statements made. This has always been an essential feature of the book in the past, and I consider it should remain so in the future. But the amount of original work published each year is so enormous that I have made no attempt to be familiar with it all; instead I have been obliged to give references to work with which I am familiar, knowing that often the references given are neither the earliest nor the most suitable for the particular statement made or experimental result quoted. I hope any author whose work has been ignored but which is more relevant or earlier than work quoted will appreciate the reason for its omission.

I have taken the opportunity in this edition to convert all relevant experimental data into metric, and usually S.I., units, the principal exceptions being the results of experiments of purely historical interest. This means that many field experiment results given in this edition are not given in the original units, so the reader must be aware of the possibility of error creeping into the conversions.

It is again a very great pleasure to acknowledge the most generous help I have received from all of my colleagues whom I have consulted. They have supplied me with information, readily provided me with illustrations, and often read and commented on many of my drafts; and I trust they will forgive me if they find either that I have not always taken their advice or have failed to appreciate the significance of their suggestions. I cannot possibly make adequate acknowledgement to all of them, though I would like to make personal acknowledgement to Drs D. S. Jenkinson, G. E. G. Mattingly and H. L. Penman of Rothamsted, Mr B. W. Avery of the Soil Survey of England and Wales, Dr R. Scott Russell and some members of his staff, particularly Drs D. T. Clarkson and M. C. Drew, at the ARC Letcombe Laboratory, Mr P. H. Nye of the Soil Science Laboratory, Oxford University, Dr F. N. Ponnemperuma of the International Rice Research Institute, Emeritus Professor G. W. Leeper of Melbourne University, and Professor D. J. Greenland and his staff, particularly Drs P. J. Harris and C. J. M. Mott of the Department of Soil Science, Reading University. Finally I am once again greatly indebted to my wife for preparing the Author Index.

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Historical and introductory

In all ages the growth of plants has interested thoughtful men. The mystery of the change of an apparently lifeless seed to a vigorous growing plant never loses its freshness, and constitutes, indeed, no small part of the charm of gardening. The economic problems are of vital importance, and become more and more urgent as time goes on and populations increase and their needs become more complex.

There was an extensive literature on agriculture in Roman times which maintained a pre-eminent position until comparatively recently. In this we find collected many of the facts which it has subsequently been the business of agricultural experts to classify and explain. The Roman literature was collected and condensed into one volume about the year 1240 by a senator of Bologna, Petrus Crescentius, whose book[1] was one of the most popular treatises on agriculture of any time, being frequently copied, and in the early days of printing, passing through many editions—some of them very handsome, and ultimately giving rise to the large standard European treatises of the sixteenth and seventeenth centuries. Many other agricultural books appeared in the fifteenth and early sixteenth centuries, notably in Italy, and later in France. In some of these are found certain ingenious speculations that have been justified by later work. Such, for instance, is Palissy's remarkable statement in 1563: 'You will admit that when you bring dung into the field it is to return to the soil something that has been taken away. . . . When a plant is burned it is reduced to a salty ash called alcaly by apothecaries and philosophers. . . . Every sort of plant without exception contains some kind of salt. Have you not seen certain labourers when sowing a field with wheat for the second year in succession, burn the unused wheat straw which had been taken from the field? In the ashes will be found the salt that the straw took out of the soil; if this is put back the soil is improved. Being burnt on the ground it serves as manure because it returns to the soil those substances that had been taken away.' But for every speculation that has been confirmed will be found many that have not, and the beginnings of agricultural chemistry

1 *Ruralium commodorum libri duodecim*, Augsburg, 1471, and many subsequent editions.