Plant Physiology: A Treatise, Vol. II, Plants in Relation to Water and Solutes


This, the second volume of a proposed six volume treatise, discusses the subject of water and solutes in relation to cells, tissues and intact plants.

In the first chapter titled, "Cell Membranes: Their Resistance to Penetration and Their Capacity for Transport," Runar Collander discusses active transport, diffusion, permeability to various substances, theory of cell permeability, and composition of the plasma membranes. The next chapter deals with the "Water Relations of Cells" by T. A. Bennet-Clark. After covering the subjects of the osmotic quantities of cells, methods of measurement, and plasmolysis, there is a discussion of water movement and osmotic behavior of tissues. O.V.S. Heath has written the next chapter on "The Water Relations of Stomatal Cells and the Mechanism of Stomatal Movement." After a brief description of methods used to study the mechanism of stomatal activity and the motive force, the major portion of the chapter is devoted to a discussion of forces controlling the turgidity of guard and subsidiary cells. Approximately one-third of the book is devoted to a discussion of "Plants in Relation to Inorganic Salts" by F. C. Steward and J. F. Sutcliffe. The first part of the chapter covers some general considerations, including a description of some of the classical work on absorption and accumulation. These introductory considerations are followed by a detailed discussion of salt accumulation by cells (Nitella and Valonia), storage tissues (potato, carrot, beet and artichoke discs) and excised roots. The latter section was written in collaboration with T. C. Broyer. The final section in the chapter deals with the salt relations of intact plants. The next chapter by C. A. Swanson deals with the "Translocation of Organic Solutes." Following a brief discussion of phloem tissues, major emphasis is placed on pathways of transport. In conclusion, the mechanism of and factors influencing translocation are presented followed by four hypotheses which have been proposed to account for the mechanism of phloem translocation. The mechanics of movement in the phloem are also mentioned by O. Biddulph at the conclusion of the next chapter which is entitled "Translocation of Inorganic Solutes." Earlier in the chapter, the upward movement of solutes, circulation patterns within the plant, and translocation from leaves was discussed. The concluding chapter by Paul J. Kramer is titled "Transpiration and the Water Economy of Plants." The major subjects discussed include water losses and absorption, including the factors which influence each, ascent of sap and internal water relations.

It is becoming increasingly difficult for any one person to have a thorough understanding of current research in many areas of scientific investigation. Thus, there is a tendency to select "specialists" to evaluate the research results in a specific "field." The specialists selected for this volume have been indicated.

It is this reviewer's opinion that the book should serve as a useful reference book, not only to plant physiologists, but also workers in related fields. Most of the authors have made use of the historical or classical work as an introduction to a discussion and evaluation of the more recent research. Where pertinent or necessary, the reader has been referred to review articles or symposia for more detailed discussions of specific subjects. Each chapter includes a lengthy bibliography. At the end of the book, in addition to a subject and author index, there is also a plant index. This should be of value to investigators interested in a particular plant or tissue of a particular plant.—George A. Pearson, U. S. Salinity Laboratory, Riverside, Calif.

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