

Plant Carbohydrates I

Intracellular Carbohydrates

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With 103 Figures



Springer-Verlag Berlin Heidelberg New York 1982

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ISBN 3-540-11060-7 Springer-Verlag Berlin Heidelberg New York
ISBN 0-387-11060-7 Springer-Verlag New York Heidelberg Berlin

Library of Congress Cataloging in Publication Data. Main entry under title: Plant carbohydrates. (Encyclopedia of plant physiology; new ser., v. 13A-). Contents: 1. Intracellular carbohydrates. Bibliography: v. 1, p. Includes index. 1. Carbohydrates. 2. Botanical chemistry. I. Loewus, Frank Abel, 1919-. II. Tanner, W. (Widmar), 1938-. III. Series: Encyclopedia of plant physiology; new ser., v. 13A, etc. QK711.2.E5 new ser. vol. 13A, etc. 581s 81-23288 [QK989.C3] [581.19'248] AACR2.

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Printed in Germany

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Typesetting, printing and bookbinding: Universitätsdruckerei H. Stürtz AG, Würzburg
2131/3130-543210

Preface

The essential features of constitution, configuration, and conformation in carbohydrate chemistry, so well established in the first half of this century, had yet to be exploited by those concerned with biochemical and physiological processes in plants when the original Encyclopedia appeared. Two outstanding developments, discovery of sugar nucleotides and the advent of chromatography, brought together the insight and a means of probing complexities inherent in plant carbohydrates. These advances, combined with a modern knowledge of enzymes and cellular metabolism, have provided new horizons of investigation for the student of plant physiology.

This volume and its companion (Vol. 13B) present a comprehensive assessment of the current viewpoint in plant carbohydrates with emphasis on those aspects which impinge on physiological processes of growth and development. To accommodate the extensive amount of information to be presented, subject matter has been divided, somewhat arbitrarily, into intracellular and extracellular carbohydrates, with the latter defined as carbohydrates occurring in space outside the plasma membrane (plasmalemma). This classification is not exclusive; rather it is intended to lend a degree of flexibility to the way in which subject matter is arranged between volumes.

The first section of this volume addresses the occurrence, metabolism, and function of monomeric and higher saccharides of fungi, algae, and higher plants. Sugar nucleotides, polyhydroxylated acids, amino sugars, polyols, branched-chain sugars, and cyclitols receive detailed treatment. Sucrose and other plant-related disaccharides and oligosaccharides are examined in depth. The second section is devoted to macromolecular carbohydrates which occur intracellularly, i.e., starch and other reserve polysaccharides, glycoproteins, glycolipids, and sterol glycosides. A final section deals with physiological processes such as secretion, storage and mobilization of carbohydrate reserves, and sugar transport. Volume 13B, which has already appeared in print (1981), contains five sections which address cell wall structure and function in algae, fungi, and higher plants, export of carbohydrate across the cell wall, cell surface interactions and the role of carbohydrate-lectin interactions in plants.

An effort has been made to follow recommendations regarding carbohydrate nomenclature as promulgated by the International Union of Pure and Applied Chemistry (IUPAC). Rules which apply to oligosaccharides and polysaccharides, now in a stage of final review by the International Union of Biochemistry (IUB), are also used. Enzyme nomenclature is that generally recommended by the IUPAC-IUB Commission on Biochemical Nomenclature although exceptions are allowed in the use of certain terms (e.g., synthetase instead of synthase, NDPsugar pyrophosphorylase instead of sugar-1-P nucleotidyltransferase), as

long as this use is consistent and in keeping with use of those terms in prior publications.

To the 62 authors whose magnificent cooperation led to production of these two volumes, the editors extend their warm and heartfelt thanks. Thanks also go to the publishers for their steady help and efficient production.

Pullman and Regensburg, January 1982

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II. Macromolecular Carbohydrates – Occurrence, Metabolism, Function

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