Gums and Stabilisers for the Food Industry 5

Editors: G.O.Phillips, D.J.Wedlock & P.A.Williams

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PREFACE

This series of books on Gums and Stabilisers, of which this is the fifth, has always had a strong relation to industrial needs. Here this aspect has been strengthened, with emphasis given to the practicalities of the subject. This entire volume is product led. Discrete sections are devoted to major groups of current industrial products:

- GUM ARABIC AND OTHER EXUDATES
- STARCH
- GELATIN
- PECTIN
- MICROBIAL POLYSACCHARIDES
- CELLULOSICS AND SEED GUMS
- MARINE POLYSACCHARIDES

The objective is to marry the technical and industrial considerations with more basic interpretation of functionality. The producer and the user have been given prominence, but the material is presented with due consideration to the underlying scientific principles which control the usefulness of the products. Structure-function relationships, for example, are repeatedly emphasised. This concentration on product functionality is based on the strong belief of the organisers that the best results with individual hydrocolloids can only be obtained if the user truly understands what he is dealing with, and why they work in practice. This may well be stating the obvious, but we have repeatedly noticed undue emphasis on the commodity characteristics of the raw materials, as distinct from their technical functionalisation.

Academic scientists will find this book particularly helpful, since it educates them about the capabilities of the products and the problems still requiring solution. They will see that many of these still remain. The integration of industrial need with academic provision is a constant objective of this series of now well-established Conferences. This book is thus a new standard text-book which all working in this field will need.

PROFESSOR GLYN O.PHILLIPS
CHAIRMAN

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The Fifth Meeting owed its success to the invaluable assistance of the Organising Committee.

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Part 1

GUM ARABIC AND OTHER GUM EXUDATES

Structure and properties of exudate gums

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ABSTRACT

Industrially-important plant gum exudates differ in molecular structure, and there are small variations in this respect among different specimens of gum from a particular species. All Acacia gums contain similarly-bound sugar and uronic acid units, but their molecular-weights and protein contents vary with species. Gum arabic may be fractionated by affinity chromatography into a major polysaccharide component, a minor one which contains as much protein as carbohydrate, and an intermediate fraction. Gum tragacanth consists of a neutral arabinogalactan and modified pectin; gum karaya is an acetylated rhamnogalacturonoglycan with neutral and acidic side chains. In gum ghatti a complex, acidic arabinogalactan moiety is attached to a core of alternating glucuronic acid and mannose residues. There are indications, apart from the limited numbers of modes of linkage between the monosaccharide units, that similar, large blocks of sugars become joined in the biosynthesis of plant gums. The analysis of plant gums requires a range of spectroscopic and chromatographic techniques, and the application of methods of chemical breakdown specifically adapted to their complex molecular structures. Availability, and acceptability as edible, limit the use of gums in foodstuffs. Satisfactory rheological, emulsifying, stabilizing and adhesive properties are sought for different commercial purposes, and possessed by plant gums in varying degrees. Molecular features may be correlated with physical.

INTRODUCTION

Although gum exudates from several hundred plant species are known, as acidic polysaccharides, they come from relatively few (fig. 1) of the ninety-two orders of angiosperm or from gymnosperms (1,2). The important industrial gum arabic (from Acacia senegal), tragacanth (Astragalus spp), karaya (Sterculia urens), ghatti (Anogeissus latifolia) and larch gum (Larix spp) have been examined in detail with respect to their composition, molecular structure, physical properties and applications (3-6). The structures of these polysaccharides have been classified A-D(2). Type A is based on a ramified 3,6-linked D-galactopyranose core to which are bound L-arabinofuranosyl units singly or in chains; exterior to the core L-rhamnopyranosyl groups are attached at O-4 to D-glucopyranuronic acid, which is linked to O-6 or O-4 of