

Nutritional Aspects and Safety of Modified Food Starches

Otto B. Wurzburg

The term "modified starches" covers a wide variety of starch-derived products. A number of techniques, such as those involved in bleaching, enzymic digestion, dextrinizing, and hydrolysis, have either no effect on the starch or are used to reduce the size of the starch molecule. The latter process is similar to the digestive process, as well as such common food-processing techniques as toasting or baking bread. Starch modifications in these categories are widely accepted as being similar to unmodified starches for use in foods. For this reason, no further attention will be given to this type of modification.

Chemical Starch Modification

This paper is devoted to those modified starches made by treating starch with agents that introduce substituent chemical moieties into the starch granule through reaction with hydroxyl groups in the starch molecule. These chemically modified starches have been used as food ingredients for over 45 years. All are cleared for use in the US, Canada, and the UK, and have been accepted by the Joint Expert Committee on Food Additives of the FAO/WHO. They impart to food systems valuable functional properties that cannot be realized with unmodified starches. They provide texture, thicken, suspend solids, stabilize emulsions, facilitate processing by protecting foods during processing, or protect finished foods during distribution and storage.

Within the broad category of chemically modified starches there are wide variations in

the extent to which the starch has been chemically altered. Many such starches contain only infinitesimal amounts of substituent groups and might be considered 99.9 percent pure starch. The presence of the added chemical groups is not readily detected except by sophisticated analytical methods or by physical characterization. Others contain sufficient amounts of substituent chemical moieties to be easily detected.

There are two major ways to modify starch chemically: crosslinking, and introduction of monosubstituent groups. Most of the modified food starches used in the food industry are made either by crosslinking or by combining crosslinking and introducing monosubstituent groups. Limited amounts of starches containing only monosubstituent groups are used in foods.

Unmodified or native starch occurs in the form of minute granules that are insoluble in cold water. They owe their integrity to crystallites formed by hydrogen bonds between hydroxyls on adjacent molecules. When heated in the presence of water, the hydrogen bonds holding the granule together weaken, permitting the granules to imbibe water, swell, and thicken to form colloidal dispersions. Such dispersions have limited value in most food systems because of the sensitivity of the hydrogen bonds responsible for the integrity of the swollen granule to thermal and mechanical breakdown.

Crosslinking as a Chemical Modification

Crosslinking reinforces starch granules with intermolecular chemical bonds that keep the swollen starch granules intact after the hydrogen bonds have been ruptured. The technique

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National Library of Medicine Current Catalog National Library of Medicine (U.S.),1982 **Current Catalog** National Library of Medicine (U.S.),1982 First multi year cumulation covers six years 1965 70 **Handbook of Food Engineering** Dennis R. Heldman,Daryl B. Lund,Cristina Sabliov,2018-12-19 As the complexity of the food supply system increases the focus on processes used to convert raw food materials and ingredients into consumer food products becomes more important The Handbook of Food Engineering Third Edition continues to provide students and food engineering professionals with the latest information needed to improve the efficiency of the food supply system As with the previous editions this book contains the latest information on the thermophysical properties of foods and kinetic constants needed to estimate changes in key components of foods during manufacturing and distribution Illustrations are used to demonstrate the applications of the information to process design Researchers should be able to use the information to pursue new directions in process development and design and to identify future directions for research on the physical properties of foods and kinetics of changes in the food throughout the supply system Features Covers basic concepts of transport and storage of liquids and solids heating and cooling of foods and food ingredients New chapter covers nanoscale science in food systems Includes chapters on mass transfer in foods and membrane processes for liquid concentration and other applications Discusses specific unit operations on freezing concentration dehydration thermal processing and extrusion The first four chapters of the Third Edition focus primarily on the properties of foods and food ingredients with a new chapter on nanoscale applications in foods Each of the eleven chapters that follow has a focus on one of the more traditional unit operations used throughout the food supply system Major revisions and or updates have been incorporated into chapters on heating and cooling processes membrane processes extrusion processes and cleaning operations Handbook of Food Science, Technology, and Engineering Yiu H. Hui,2006 **Handbook of Food Analysis: Physical characterization and nutrient analysis** Leo M. L. Nollet,2004 This two volume handbook supplies food chemists with essential information on the physical and chemical properties of nutrients descriptions of analytical techniques and an assessment of their procedural reliability The new edition includes two new chapters that spotlight the characterization of water activity and the analysis of inorganic nutrients and provides authoritative rundowns of analytical techniques for the sensory evaluation of food amino acids and fatty acids neutral lipids and phospholipids and more The leading reference work on the analysis of food this edition covers new topics and techniques and reflects the very latest data and methodological advances in all chapters **Handbook of Food Analysis: Methods and instruments in applied food analysis** Leo M. L. Nollet,2004 Presents contemporary methods of measuring optical properties moisture ash content and other physical characteristics of food and evaluates techniques used to trace nutrient analytes ranging from peptides proteins and enzymes to aroma compounds to carbohydrates and starch Food Process Design Zacharias B. Maroulis,George D. Saravacos,2003-05-09 This timely

reference utilizes simplified computer strategies to analyze develop and optimize industrial food processes and offers procedures to assess various operating conditions engineering and economic relationships and the physical and transport properties of foods for the design of the most efficient food manufacturing technologies and eq *Emerging Technologies for Food Processing* Da-Wen Sun,2014-08-14 The second edition of *Emerging Technologies in Food Processing* presents essential authoritative and complete literature and research data from the past ten years It is a complete resource offering the latest technological innovations in food processing today and includes vital information in research and development for the food processing industry It covers the latest advances in non thermal processing including high pressure pulsed electric fields radiofrequency high intensity pulsed light ultrasound irradiation and addresses the newest hurdles in technology where extensive research has been carried out Provides an extensive list of research sources to further research development Presents current and thorough research results and critical reviews Includes the most recent technologies used for shelf life extension bioprocessing simulation and optimization

Present and Future of High Pressure Processing
Francisco J. Barba,Carole Tonello-Samson,Eduardo Puértolas,María Lavilla,2020-08-22 Developed for academic researchers and for those who work in industry *Present and Future of High Pressure Processing A Tool for Developing Innovative Sustainable Safe and Healthy Foods* outlines innovative applications derived from the use of high pressure processing beyond microbial inactivation This content is especially important for product developers as it includes technological physicochemical and nutritional perspectives This book specifically focuses on innovative high pressure processing applications and begins with an introduction followed by a section on the impact of high pressure processing on bioactive compounds and bioaccessibility bioavailability The third section addresses the ways in which high pressure processing can assist in the reduction of toxins and contaminants while the fourth section presents opportunities for the use of high pressure processing in the development of healthy and or functional food This reference concludes with an analysis of the challenges regarding the use of high pressure processing as an innovative application Explores the use of high pressure processing as a tool for developing new products Outlines the structure and improved functional properties provided by high pressure processing Illustrates potential applications and future trends of high pressure processing Explains the mechanisms that influence the impact of high pressure processing Highlights the optimal conditions for high pressure processing to develop certain food products Defines the challenges and future perspectives in the use of high pressure processing for food product development

Indigenous Fermented Foods for the Tropics Oluwafemi Ayodeji Adebo,Chiemela Enyinnaya Chinma,Adewale Olusegun Obadina,Antonio Gomes Soares,Sandeep K. Panda,Ren-You Gan,2023-01-21 *Indigenous Fermented Foods for the Tropics* provides insights on fermented foods of the Tropics particularly Africa Asia and South America highlighting key aspects and potential developments for these food products Sections provide an overview on the production and composition nutritional physicochemical health beneficial and microbiota of these indigenous fermented

foods in the tropics innovative techniques for investigating the composition of these fermented food products and improvement of the fermentation process to yield better nutritional constituents health beneficial components and sensory qualities and safety aspects to be considered in fermented foods Other sections provide insights into the packaging and marketing of these food products as well as future prospects of fermented foods in the tropics This book provides new perspectives and recent information to complement existing texts on indigenous fermented foods serving as a valuable reference text for detailed insights into indigenous fermented foods of the tropics Discusses fermented foods from the Africa Asia and South America based on the raw materials used Offers innovative techniques for improving these indigenous products and investigating their composition as well as upgrading traditional technologies used in the production of fermented products Covers the role of technology and innovations in the quest for enhancing quality and safety of fermented foods as demand for fermented food and beverage products is increased *Animal Feed Science and Nutrition*, 2022-05-18

Animal food production faces many challenges including shortage of high quality feed ingredients contribution of greenhouse gases and pollutants to the environment development of antimicrobial resistance food safety and animal health and welfare This examines these issues over three sections The first section is the introduction The second section provides insights into optimization of pasture utilization employing different supplements and feed additives to maximize beef cattle production use of insect meal as a promising protein feed ingredient and ruminal microbiome manipulation to improve ruminal fermentation efficiency The third section discusses accurate estimation of enteric methane emission factors reduction of enteric methane emissions by means of feeding management and antimethanogenic compounds and different heavy metal pollution by poultry wastes and associated health hazards **Whole Grains** Shabir Ahmad Mir, Annamalai Manickavasagan, Manzoor Ahmad Shah, 2019-03-04 Whole grains play an important role in healthy diets due to their potential role in minimizing the risk factors for several diseases Thus the need for a comprehensive work that addresses all aspects of whole grain technology including processing product development and nutrition values This book covers the technological nutritional and product development aspects of all whole grains including wheat rice barley rye sorghum millet maize and oats among others The book will review and summarize current knowledge in whole grains with the intent of being helpful to the food industry in the development of high quality whole grain products Key Features Covers the technology for whole grain processing Promotes the utilization of whole grain products Provides the information about the nutritional components of whole grains Explores the health benefits of whole grains Presents the latest trends and safety concerns of whole grains The chapters include amaranth barley brown rice buckwheat maize millets oats quinoa rye sorghum and wheat In addition current trends in processing technology and product development for whole grains are explained in detail in a separate chapter The last chapter deals with the food safety management of whole grains Contributions from global experts in this field make this book a key reference material for all aspects of whole grains This book is suitable for students scientists and professionals in food science food engineering

food technology food processing product development food marketing nutrition and other health sciences **Microwave Processing of Foods: Challenges, Advances and Prospects** Anubhav Pratap Singh, Ferruh Erdogdu, Shaojin Wang, Hosahalli S. Ramaswamy, 2024-08-27 The application of microwaves has been a major advancement in food processing over the past 50 years and yet to date there have been very few publications focusing exclusively on microwave processing and none covering the latest technological and theoretical advances Microwave Processing of Foods Challenges Advances and Prospects fills this gap by covering all aspects of the microwave processing of foods including the latest novel advances in this fast moving subject area This text presents multidisciplinary views of novel microwave systems novel process modeling engineering and design as well as practical approaches on methodology and findings regarding the effect of microwave on the food quality and process safety The volume comprises several chapters on the newest processing and machinery aspects engineering design and process modeling process safety and novel processes based on full or partial application of microwave in food processing This book also considers economic aspects food quality issues and future trends of microwave application in the food industry Each chapter in this text functions as a critical review presenting the current state of knowledge based on the personal experience of the authors and the current state of published research in one particular area of food processing While the main focus is on processing the physical principles and the chemical and microbiological basis of the process are also covered plus the impact of the technology on the quality and safety of food This book presents a comprehensive and fully up to date reference on the principles and applications of microwave processing of food products Engineering Properties of Foods, Fourth Edition M.A. Rao, Syed S.H. Rizvi, Ashim K. Datta, Jasim Ahmed, 2014-04-22 It has been nearly a decade since the third edition of Engineering Properties of Foods was published and food structure microstructure remains a subject of research interest In fact significant developments have taken place in the area of high pressure processing HPP which has been approved for pasteurization of food by the Food and Drug Administration Kinetic data related to HPP have proven important for validation of pressure assisted pasteurization Due to these developments three new chapters have been added to the Fourth Edition Food Microstructure Analysis Glass Transition in Foods Kinetics and Process Design for High Pressure Processing The text focuses on elucidating the engineering aspects of food properties and their variations supplemented by representative data Chapters have been updated and revised to include recent developments The book presents data on physical chemical and biological properties illustrating their relevance and practical importance The topics range from surface properties rheological properties and thermal properties to thermodynamic dielectric and gas exchange properties The chapters follow a consistent format for ease of use Each chapter contains an introduction food property definition measurement procedure modeling representative data compilation and applications **Sustainable Food Innovation** Luca Serventi, 2023-03-16 This text offers a holistic approach to the two topics of the highest interest in the current and future food industry sustainability and nutrition The

current knowledge is narrow and specific to individual topics focusing on either one nutrient or one discipline Food is part of a wide circle of disciplines nutrition technology sensory environmental aspects psychology economy culture and society In the recent years the sales of innovative foods such as meatless burgers allergen free products and personalized nutrition have skyrocketed Sustainable Food Innovation presents the big picture on each nutrient industrial and natural sources ingredients food products consumer acceptability price sensory quality and nutritional properties quantity and quality with each chapter focusing on a specific essential nutrient Further chapters illustrate the role of other elements of interest such as bioactive In addition experimental data is added to enrich the book Online discussions on current food trends are analyzed and presented to the reader in the effort to understand consumers psychology This will be the first publication to combine literature review and research data and the first to offer a comprehensive discussion on sustainable food innovation The ultimate goal is to educate consumers and experts providing technical and socioeconomic knowledge in a multidisciplinary context Ultimately informed technologists will develop healthier sustainable food products and informed consumers will make informed decisions on nutrition and food choices

Innovation of Food Products in Halal Supply Chain Worldwide

Aishah Bujang,Siti Aimi Sarah Zainal Abidin,Nina Naquiah Ahmad Nizar,2023-04-01 Innovation of Food Products in the Halal Supply Chain Worldwide covers the fundamentals and food guidelines of halal food production Unlike other texts on the halal food market and halal certification this book promotes halal product innovation by presenting exciting newly developed ingredients that are substitutions of non halal ingredients with halal alternatives such as lard substituted with modified vegetable fats pig with halal goat beef camel fish gelatin collagen alternative meat substitute or even additives Innovations in halal processing technologies cover the latest techniques in halal production and authentication halal tracking traceability in halal transport and logistics a vast area at the end of a supply chain All chapters are written by acknowledged experts in their field thus the book brings together the top researchers in this essential topic of importance to a huge percentage of the world s population Helps readers understand the advancement of available halal substitutes and replacers Offers tools to enhances product sustainability and food security through innovation Fosters innovation in food science with alternative halal ingredients

Handbook of Food and Beverage Fermentation Technology Y. H. Hui,Lisbeth Meunier-Goddik,Jytte

Josephsen,Wai-Kit Nip,Peggy S. Stanfield,2004-03-19 Over the past decade new applications of genetic engineering in the fermentation of food products have received a great deal of coverage in scientific literature While many books focus solely on recent developments this reference book highlights these developments and provides detailed background and manufacturing information Co Edited by Fidel

Food Processing Stephanie Clark,Stephanie Jung,Buddhi

Lamsal,2014-06-03 FOOD PROCESSING Food Processing Principles and Applications Second Edition is the fully revised new edition of this best selling food technology title Advances in food processing continue to take place as food scientists and food engineers adapt to the challenges imposed by emerging pathogens environmental concerns shelf life quality and safety as

well as the dietary needs and demands of humans In addition to covering food processing principles that have long been essential to food quality and safety this edition of Food Processing Principles and Applications unlike the former edition covers microbial enzyme inactivation kinetics alternative food processing technologies as well as environmental and sustainability issues currently facing the food processing industry The book is divided into two sections the first focusing on principles of food processing and handling and the second on processing technologies and applications As a hands on guide to the essential processing principles and their applications covering the theoretical and applied aspects of food processing in one accessible volume this book is a valuable tool for food industry professionals across all manufacturing sectors and serves as a relevant primary or supplemental text for students of food science *Handbook of Food Enzymology* John R. Whitaker, Alphons G. J. Voragen, Dominic W.S. Wong, 2002-12-05 Discussing methods of enzyme purification characterization isolation and identification this book details the chemistry behavior and physicochemical properties of enzymes to control enhance or inhibit enzymatic activity for improved taste texture shelf life nutritional value and process tolerance of foods and food products The book cov *Biotechnology, Food Science and Technology* Lara Wiggert, 1993

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