

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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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

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

Application of Nanotechnology in Food Science, Processing and Packaging Chukwuebuka Egbuna, Jaison Jeevanandam, Kingsley C. Patrick-Iwuanyanwu, Eugene N. Onyeike, 2022-05-03 This book entitled *Application of Nanotechnology in Food Science Processing and Packaging* presents up to date information on the emerging roles of nanotechnology in food industry its fundamental concepts techniques and applications The application of nanotechnology in the food industry is an emerging area which has found tremendous use in improving food quality through the enhancement of food taste texture colour and flavour Also its application has improved the bioavailability and target delivery of certain bioactive food ingredients through controlled release of nutrients a feature that is impossible with the conventional methods of food processing The application of nanotechnology in food packaging for the detection of contaminants pathogens biotoxins and pesticides through nanosensor safety evaluations has led to the increase in shelf life of products and quality assurance through the detection and monitoring of toxins This book taps from the experience of subject experts from key institutions around the world The users of this book will benefit greatly as the chapters were simplified and arranged carefully to aid proper understanding consistency and continuity

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

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

Physical Principles of Food Preservation Marcus Karel, Daryl B. Lund, 2003-06-20 This reference examines the properties conditions and theoretical principles governing the safety and efficacy of various food preservation storage and packaging techniques The book analyzes methods to predict and optimize the nutrition texture and quality of food compounds while reducing operating cost and waste The Second Edition contains new chapters and discussions on non thermal processes the mechanisms of heat transfer including conduction convection radiation and dielectric and microwave heating the kinetic parameters of food process operations freezing technology using illustrative examples recent breakthroughs in cryochemistry and cryobiology and more

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

Non-Thermal Processing of Functional Foods
Sudip Kumar Pattanayek, Debashis Dutta, Ajay Singh, 2024-12-31 Functional foods also known as nutraceuticals began to gain prominence in the 1980s in Japan as foods for specified health use and became more widely recognized in the 1990s as research and interest in foods that could provide specific health benefits beyond essential nutrition grew worldwide These foods are typically enriched with bioactive components or formulated to contain substances or live microorganisms with a possible health enhancing or disease preventing value and at a safe and sufficiently high concentration to achieve the intended benefit Usually the added ingredients are classified as nutrients dietary fiber phytochemicals other substances or probiotics The production storage and consumer consumption of these functional foods require special attention to preserve quality attributes The production process of these foods can be classified as conventionally used thermal processing methods and non thermal alternatives In addition these processes may be combined with biological approaches involving enzymatic treatment and fermentation The various non thermal processes such as ultrasounds high hydrostatic pressure vacuum impregnation high voltage electrical discharge cold plasma pulsed light ozonation etc can be utilized for a product to sustain preserve quality attributes of the ingredients long shelf life and sensory qualities This book compiles the latest non thermal processing technologies to develop functional foods The book discusses bioactivity bioaccessibility and bioavailability related to nutrition and functional food ingredients It has 16 articles on different aspects of non thermal processing technologies Chapter 1 has discussed a general overview of emerging technologies and various non thermal processing techniques are discussed in Chapters 2 6 8 9 and 12 Chapters 7 11 13 15 and 16 discuss food safety and preservation We have discussed the functional foods and bioactive compounds in Chapters 10 and 14 A few of these reviews discuss the impact of developing non thermal technologies on several food components proteins carbohydrates lipids minerals vitamins polyphenols glucosinolates fragrance compounds and enzymes while maintaining the structure and functional properties This book is an excellent source of information for professionals postgraduate students and researchers in food sciences and chemical engineering

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

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

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