

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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Handbook of Nutrition and Diet Babasaheb B. Desai,2000-08-16 This handbook of nutrition and diet provides information on food nutrients and their functions food safety and distribution food composition consumption and utilization adequacy of diet and the nutritional management of diseases and disorders It also discusses the effects of nutrition and diet on diseases of the bones teeth hair kidneys l *Introduction to Food Science and Technology* G.F. Stewart,Maynard A. Amerine,2012-12-02 The Second Edition of this popular textbook has benefited from several years of exposure to both teachers and students Based on their own experiences as well as those of others the authors have reorganized added and updated this work to meet the needs of the current curriculum As with the first edition the goal is to introduce the beginning student to the field of food science and technology Thus the book discusses briefly the complex of basic sciences fundamental to food processing and preservation as well as the application of these sciences to the technology of providing the consumer with food products that are at once appealing to the eye pleasing to the palate and nutritious to the human organism

Introduction to Food Science and Technology is set in the world in which it operates it contains discussions of historical development the current world food situation the safety regulations and laws that circumscribe the field and the careers that it offers

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

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

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

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

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

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 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 Science and Technology* Oluwatosin Ademola Ijabadeniyi, 2023-11-06 Food Science and Technology Fundamentals and Innovation presents the aspects of microbiology chemistry nutrition and process engineering required for the successful selection preservation processing packaging and distribution of quality food It is a valuable resource for researchers and students in food science technology and food industry professionals and entrepreneurs There are two new chapters in the 2nd Ed COVID 19 and food supply chain as well as climate smart 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 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 **Medical and Health Care Books and Serials in Print** ,1997 Green Technologies in Food Production and Processing Joyce I. Boye, Yves Arcand, 2012-01-10 Examining the full cycle from farm to fork this book reviews the current status of green processing in the agriculture and agri food sector and provides strategies for enhancing the use of environmentally friendly technologies for production and processing **Bibliography of Agriculture** ,1991-04

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