



Review article

An overview of natural antimicrobials role in food

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ABSTRACT

The present paper aims to review the natural food preservatives with antimicrobial properties emphasizing their importance for the future of food manufacturing and consumers' health. The extraction procedures applied to natural antimicrobials will be considered, followed by the description of some natural preservatives' antimicrobial mechanism of action, including (i) membrane rupture with ATP-use activity inhibition, (ii) leakage of essential biomolecules from the cell, (iii) disruption of the proton motive force and (iii) enzyme inactivation. Moreover, a provenance-based classification of natural antimicrobials is discussed by considering the sources of origin for the major natural preservative categories: plants, animals, microbes and fungi. As well, the structure influence on the antimicrobial potential is considered. Natural preservatives could also constitute a viable alternative to address the critical problem of microbial resistance, and to hamper the negative side effects of some synthetic compounds, while meeting the requirements for food safety, and exerting no negative impact on nutritional and sensory attributes of foodstuffs.

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1. Introduction: biopreservation and fighting foodborne microbial pathogens

Many foodborne diseases are caused by ingestion of food contaminated with microbial pathogens. Many studies are focused on counteracting the action of such food related pathogens and on

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**Mirian A. F. Hayashi, Fernando César
Bizerra, Pedro Ismael Da Silva Junior**

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Antimicrobial compounds from natural sources Mirian A. F. Hayashi, Fernando César Bizerra, Pedro Ismael Da Silva Junior, 2014-08-29 Nature is a generous source of compounds with the potential to treat diseases including infectious diseases which is of utmost importance for modern medicine as antimicrobial resistances increase Known sources of natural compounds with valuable antimicrobial activity include medicinal plants and marine and terrestrial organisms such as fungi and bacteria Nevertheless there is still a vast fauna and flora that once systematically explored could provide additional antimicrobial leads and drugs Investigators are welcome to contribute original research and or review articles in this area specifically with studies exploiting the mechanism of action and the structure activity aspects of natural compounds with antimicrobial activity that provide insights into potential ways to overcome antimicrobial resistance

Modeling Microbial Responses in Food Robin C. McKellar, Xuewen Lu, 2003-12-29 The first state of the art review of this dynamic field in a decade Modeling Microbial Responses in Foods provides the latest information on techniques in mathematical modeling of microbial growth and survival The comprehensive coverage includes basic approaches such as improvements in the development of primary and secondary models statistical

Natural Compounds and Novel Sources of Antimicrobial Agents for Food Preservation and Biofilm Control Lizziane Kretli Winkelströter, Eugenia Bezirtzoglou, Fabricio Luiz Tulini, 2022-04-22

Pulsed Electric Fields Technology for the Food Industry Javier Raso, Volker Heinz, Ignacio Alvarez, Stefan Toepfl, 2022-01-01 Many novel technologies have been proposed in the attempt to improve existing food processing methods Among emerging nonthermal technologies high intensity pulsed electric fields PEF is appealing due to its short treatment times and reduced heating effects This book presents information accumulated on PEF during the last 15 years by experienced microbiologists biochemists food technologists and electrical and food engineers

Essential Oils as Antimicrobial Agents in Food Preservation Jian Ju, 2023-03-27 Perishable products such as fruits and vegetables account for the largest proportion of food loss due to their short shelf life especially in the absence of proper storage facilities which requires sustainable universal and convenient preservation technology The existing methods to prolong the shelf life of food mainly include adding preservatives irradiation cold storage heat treatment and controlled atmosphere storage But with disadvantages in irradiation cold storage heat treatment and controlled atmosphere storage chemical synthetic preservatives are still the main means to control food corruption As the food industry responds to the increasing consumer demand for green safe and sustainable products it is reformulating new products to replace chemical synthetic food additives Essential Oils as Antimicrobial Agents in Food Preservation provides a comprehensive introduction to the antimicrobial activity of plant essential oils and their application strategies in food preservation It is aimed at food microbiology experts food preservation experts food safety experts food technicians and students Features Summarizes the application strategy and safety of essential oil in the field of food preservation Describes the synergistic antibacterial effect of essential oil and antimicrobial

agents Explains the action mechanism of essential oil as antimicrobial agent against foodborne fungi foodborne bacteria viruses and insects Analyzes the antimicrobial activity of essential oil in gas phase The book discusses how as a natural antimicrobial and antioxidant essential oil has great potential to be used in the food industry to combat the growth of foodborne pathogens and spoilage microorganisms But because the essential oil itself has obvious smell and is sensitive to light and heat it cannot be directly added to the food matrix and thus the application strategies presented in this book explain how to alleviate those issues

Utilisation of Bioactive Compounds from Agricultural and Food Production Waste

Quan V. Vuong, 2017-09-07 The large quantity of waste generated from agricultural and food production remains a great challenge and an opportunity for the food industry As there are numerous risks associated with waste for humans animals and the environment billions of dollars are spent on the treatment of agricultural and food waste Therefore the utilisation of bioactive compounds isolated from waste not only could reduce the risks and the costs for treatment of waste but also could potentially add more value for agricultural and food production This book provides comprehensive information related to extraction and isolation of bioactive compounds from agricultural and food production waste for utilisation in the food cosmetic and pharmaceutical industries The topics range from an overview on challenges and opportunities related to agricultural and food waste the bioactive compounds in the waste the techniques used to analyse extract and isolate these compounds to several specific examples for potential utilisation of waste from agricultural and food industry This book also further discusses the potential of bioactives isolated from agricultural and food waste being re utilised in the food cosmetic and pharmaceutical industries It is intended for students academics researchers and professionals who are interested in or associated with agricultural and food waste

Functional Polymers in Food Science

Giuseppe Cirillo, Umile Gianfranco Spizzirri, Francesca Iemma, 2015-03-10 Polymers are an important part in everyday life products made from polymers range from sophisticated articles such as biomaterials to aerospace materials One of the reasons for the great popularity exhibited by polymers is their ease of processing Polymer properties can be tailored to meet specific needs by varying the atomic composition of the repeat structure by varying molecular weight and by the incorporation via covalent and non covalent interactions of an enormous range of compounds to impart specific activities In food science the use of polymeric materials is widely explored from both an engineering and a nutraceutical point of view Regarding the engineering application researchers have discovered the most suitable materials for intelligent packaging which preserves the food quality and prolongs the shelf life of the products Furthermore in agriculture specific functionalized polymers are used to increase the efficiency of treatments and reduce the environmental pollution In the nutraceutical field because consumers are increasingly conscious of the relationship between diet and health the consumption of high quality foods has been growing continuously Different compounds e g high quality proteins lipids and polysaccharides are well known to contribute to the enhancement of human health by different mechanisms reducing the risk of cardiovascular disease coronary disease and

hypertension This first volume of this two volume book concerns the application of polymers in food packaging

Application of Alternative Food-Preservation Technologies to Enhance Food Safety and Stability Antonio

Bevilacqua, Milena Sinigaglia, 2010 The book covers the applications of some alternative approaches for prolonging food shelf life The book describes the role of food safety objectives natural compounds such as oils and microbial enzymes pressure and atmospheric techniques and alternat

Antimicrobial Food Additives Erich Lück, Martin Jäger, 1997 The preservation of food by chemical techniques has remained an important topic in food science and technology and a major branch of food processing in industry The authors both leading scientists at Hoechst AG s Food Research Department review all aspects of food preservation by chemical techniques the majority of which involve the use of chemical additives The first sections deal with general aspects of importance to all preservatives special chapters concentrate on the properties and uses of industrial preservatives The detailed and practice oriented explanations make this edition a valuable source of information for food specialists in industry government authorities and nutritional science

Photonic Detection and Intervention

Technologies for Safe Food Yud-Ren Chen, Shu-I. Tu, 2001

Proteomics for Studying Foodborne Microorganisms

and Their Impact on Food Quality and Human Health Rosa Anna Siciliano, Sergio Uzzau, Maria Fiorella

Mazzeo, 2019-10-15 Foodborne microorganisms play a pivotal role in mediating the tight relation between food and human health from a dual perspective In fact notwithstanding the introduction of strict regulations and new technologies to ensure food quality and safety foodborne pathogens continue to cause infections and diseases and represent a serious public health concern while spoilage bacteria can severely affect food quality thus leading to major industry and commercial losses On the other hand probiotics positively affect human health promoting digestion and uptake of dietary nutrients strengthening intestinal barrier function modulating immune response and enhancing antagonism towards pathogens Nowadays proteomics represents a key discipline to perform high throughput studies in the field of food microbiology and enables the most accurate identification of complex networks of proteins involved in the cell adaptation to different growth conditions as well as in beneficial or harmful effects on human health The present eBook offers an overview of the most up to date proteomic methodologies and further assesses the strength of proteomics in exploring different aspects of the foodborne microorganism life style and defining biomarkers of food quality and safety

Lipid Oxidation in Food and Biological Systems

Carlos Bravo-Díaz, 2022-02-06 This book offers a new physical chemistry perspective on the control of lipid oxidation reactions by antioxidants and it further explores the application of several oxidation inhibition strategies on food and biological systems Divided in 3 parts the book reviews the latest methods to control lipid oxidation it examines lipid oxidation and inhibition in different food systems and it finishes with an overview of the biological health and nutritional effects of lipid oxidation Chapters from expert contributors cover topics such as the use of magnetic methods to monitor lipid and protein oxidation the kinetics and mechanisms of lipid oxidation and antioxidant inhibition reactions interfacial chemistry oxidative stress and

its impact in human health nutritional sensory and physiological aspects of lipid oxidation and new applications of plant and marine antioxidants While focused on lipid peroxidation in food and biological systems the chemistry elucidated in this book is applicable also to toxicology medicine plant physiology and pathology and cosmetic industry The book will therefore appeal to researchers in the lipid oxidation field covering food biological and medical areas *Functional Food Products and Sustainable Health* Saghir Ahmad,Nasser Abdulatif Al-Shabib,2020-08-29

There is a growing global awareness of the link between good diet and health This fascinating book reviews various functional foods or nutraceuticals and the bio active compounds they contain in order to identify the role of bioactive compounds such as nisin micronutrients and hydrocolloids in the diet in overall human health It also provides up to date information on functional elements like antioxidants dietary fibres pre probiotics vitamins and mineral enriched foods in the human diet Consisting of fifteen chapters the book offers a systematic review of the key factors in the preparation of functional foods from selected sources and also describes the processing preservation and packaging of a range of functional food products This book is a valuable resource for students and researchers working in the field of food science food technology and nutrition as well as for industry experts

Nano-Strategies for Addressing Antimicrobial Resistance Vinay Kumar,Varsha Shriram,Ravi Shukla,Suresh Gosavi,2022-12-18 Antibiotics the backbone of modern clinical medicine are facing serious challenges from emerging antimicrobial resistance AMR a complicated phenomenon expanding in bacterial species from nosocomial to community origins where microbes are no longer sensitive to a range of commonly used antibiotics AMR has exploded in recent years and is posing a serious threat to human health and survival This necessitates novel and effective ways of diagnosis drug delivery and treatment nanotechnology and advanced nanomaterials are hailed as a potent solution in containing AMR The main thrust of this volume is to explain the most current research on the central theme of potential use of nano approaches for diagnosis detection drug delivery and as antimicrobial agents against drug resistant pathogenic microbes This book provides an integrated blend of basic and advanced information for students scholars scientists and practitioners interested or already engaged in research in these areas We have brought together leading international authors to present and highlight various aspects of nanotechnology in combating AMR in WHO prioritized microbes Topics range from advances in nanomaterial synthesis characterization functionalization and improvisation as well as applications in sensing diagnosis of AMR and their therapeutic and drug delivery potential against MDR and XDR microbial phenotypes **Antimicrobial**

Dressings Raju Khan,Sorna Gowri,2023-02-10 Antimicrobial Dressings The Wound Care Applications explores the literature surrounding the catalytic behavior of proteolytic enzymes immobilized together with nanoparticles As numerous applications using proteolytic enzymes for debridement silver as antibiotic and nanoparticles for enzyme immobilization were developed in the last years this book explores interdisciplinary information combining nanotechnology biotechnology and medicine and how it s still in early stages The book adopts a holistic approach in a lifecycle context to evaluate their final feasibility

including industrial exploitability without disregard of the potential risks of enzymes and nanomaterials to human health and the environment Describes the drawback of using unstable enzymes in wound debridement such as infections irritations low availability rapid elimination from the body and impossibility of creating a high local concentration of the preparation without increasing its systemic concentration Provides information on higher efficient antimicrobial property and enzyme stability using nanoparticles as carriers for enzyme immobilization due to minimum diffusional limitation maximum surface area per unit mass and high enzyme loading Discusses the physical characteristics of the nanoparticles through multilayer polyelectrolytes encasing such as diffusion and particle mobility that will influence the catalytic activity pH and thermal stability of attached enzymes

Food Process Engineering and Technology Zeki Berk, 2013-06-08 The past 30 years have seen the establishment of food engineering both as an academic discipline and as a profession Combining scientific depth with practical usefulness this book serves as a tool for graduate students as well as practicing food engineers technologists and researchers looking for the latest information on transformation and preservation processes as well as process control and plant hygiene topics Strong emphasis on the relationship between engineering and product quality safety Links theory and practice Considers topics in light of factors such as cost and environmental issues

Handbook of Food Preservation Mohammad Shafiur Rahman, 2020-06-10 The processing of food is no longer simple or straightforward but is now a highly inter disciplinary science A number of new techniques have developed to extend shelf life minimize risk protect the environment and improve functional sensory and nutritional properties Since 1999 when the first edition of this book was published it has facilitated readers understanding of the methods technology and science involved in the manipulation of conventional and newer sophisticated food preservation methods The Third Edition of the Handbook of Food Preservation provides a basic background in postharvest technology for foods of plant and animal origin presenting preservation technology of minimally processed foods and hurdle technology or combined methods of preservation Each chapter compiles the mode of food preservation basic terminologies and sequential steps of treatments including types of equipment required In addition chapters present how preservation method affects the products reaction kinetics and selected prediction models related to food stability what conditions need be applied for best quality and safety and applications of these preservation methods in different food products This book emphasizes practical cost effective and safe strategies for implementing preservation techniques for wide varieties of food products Features Includes extensive overview on the postharvest handling and treatments for foods of plants and animal origin Describes comprehensive preservation methods using chemicals and microbes such as fermentation antimicrobials antioxidants pH lowering and nitrite Explains comprehensive preservation by controlling of water structure and atmosphere such as water activity glass transition state diagram drying smoking edible coating encapsulation and controlled release Describes preservation methods using conventional heat and other forms of energy such as microwave ultrasound ohmic heating light irradiation pulsed electric field high pressure and magnetic field

Revised updated and expanded with 18 new chapters the Handbook of Food Preservation Third Edition remains the definitive resource on food preservation and is useful for practicing industrial and academic food scientists technologists and engineers

Antibiotic Resistance Kateryna Kon, Mahendra Rai, 2016-06-14 Antibiotic Resistance Mechanisms and New Antimicrobial Approaches discusses up to date knowledge in mechanisms of antibiotic resistance and all recent advances in fighting microbial resistance such as the applications of nanotechnology plant products bacteriophages marine products algae insect derived products and other alternative methods that can be applied to fight bacterial infections Understanding fundamental mechanisms of antibiotic resistance is a key step in the discovery of effective methods to cope with resistance This book also discusses methods used to fight antibiotic resistant infection based on a deep understanding of the mechanisms involved in the development of the resistance Discusses methods used to fight antibiotic resistant infection based on a deep understanding of mechanisms involved in the development of the resistance Provides information on modern methods used to fight antibiotic resistance Covers a wide range of alternative methods to fight bacterial resistance offering the most complete information available Discusses both newly emerging trends and traditionally applied methods to fight antibiotic resistant infections in light of recent scientific developments Offers the most up to date information in fighting antibiotic resistance Includes involvement of contributors all across the world presenting questions of interest to readers of both developed and developing countries Proceedings of the First International Symposium on Natural Preservatives in Food Systems Daphna Havkin-Frenkel, C. Frankel, Nativ Dudai, 2006 **Handbook of Food Preservation** M. Shafiur Rahman, 2007-07-16 The processing of food is no longer simple or straightforward but is now a highly interdisciplinary science A number of new techniques have developed to extend shelf life minimize risk protect the environment and improve functional sensory and nutritional properties The ever increasing number of food products and preservation techniques cr

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