The Future of Plant Protein

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Editors

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Innovations, Challenges, and Opportunities

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This book is dedicated to the authors who have contributed to its completion.

Foreword

Plants are not only a source of food but also a source of protein. Protein is an essential macronutrient in building and maintaining the body's tissues, organs, and functions. However, not all proteins are created equal. Some proteins are more complete, digestible, and beneficial than others. In this book, we will explore the world of plant proteins and how they can offer a sustainable and healthy alternative to animal proteins. We will also examine the innovations, challenges, and opportunities shaping plant protein's future. We will introduce some novel plant protein sources discovered or developed by researchers and entrepreneurs. These include duckweed, microalgae, quinoa, hemp, and many more. We will compare their nutritional value, digestibility, and allergenicity with conventional plant protein sources, such as soybeans, beans, lentils, nuts, seeds, and grains. We will also discuss their environmental impact, production methods, and potential applications. Next, we will address some barriers and obstacles plant protein faces in reaching consumers. These include consumer perception and preference, sensory attributes and nutritional profiles, accessibility and affordability, production and distribution systems, and regulatory and policy issues. We will analyze the factors influencing consumer behavior and choice regarding plant protein and how they can be changed or improved. We will also explore the strategies and solutions that plant-based food companies are using or developing to overcome these challenges. Finally, we will look at some of plant protein's opportunities and prospects in meeting the growing demand for alternative protein sources. We will examine the trends and drivers shaping the global market for alternative proteins, such as population growth, urbanization, income growth, environmental awareness, health consciousness, and animal welfare concerns. We will also highlight the innovations and expansions that plant-based food companies are pursuing or planning to capture this market.

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Preface

The demand for sustainable, health-enhancing dietary practices is paramount in an era of significant environmental shifts and a growing global population. "The Future of Plant Protein: Innovations, Challenges, and Opportunities" delves into the critical role of plant protein in revolutionizing food systems, serving as a valuable resource for researchers, industry experts, policymakers, and health enthusiasts. It addresses food security, environmental sustainability, and human health, comprehensively exploring plant protein's benefits, nutritional characteristics, and impact on the food industry. The book begins with an overview of plant protein, highlighting its nutritional benefits and role in sustainable food production. It then examines the dietary aspects of plant protein, including its amino acid balance and comparison with animal protein, emphasizing the importance of a balanced diet. A thorough sustainability analysis follows, showcasing the environmental advantages of plant-based diets and comparing the resources needed for plant and animal protein production, supplemented with case studies on sustainable practices in plant protein production. The discussion progresses to current trends and future perspectives in the plant-based food industry, touching on scientific advancements in plant breeding, genetics, and biotechnology that enhance plant-based foods' protein content and quality. Additionally, the book explores processing technologies, sensory attributes, and regulatory issues related to plant protein products, offering insights into creating consumer-appealing products and effective marketing strategies. Concluding with a forward-looking view on the challenges and opportunities in the plant-based food industry and the impact of plant protein consumption on human health, the book emphasizes that embracing plant protein is a crucial step toward reshaping our food systems for a sustainable and healthy future. "The Future of Plant Protein" invites readers on an enlightening journey through the evolving landscape of plant protein, urging a shift toward more sustainable dietary choices to better the environment and our well-being.

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About the Editors

Kaiser Younis is a food technologist and academician specializing in food engineering and technology. He has done his PhD at Aligarh Muslim University, Aligarh. He is the author of several books and has published numerous research papers. He is a life member of various professional bodies and is focusing on developing innovative plant based meat products. Kaiser Younis is widely recognized for his technical expertise and significant contributions to food technology.

Owais Yousuf is an assistant professor of food technology at the Islamic University of Science and Technology in Awantipora, Jammu and Kashmir. He has completed a BTech from IUST and an MTech from Aligarh Muslim University. He has a PhD in post-harvest process and food engineering from Govind Ballabh Pant University of Agriculture and Technology, where he worked on ultrasound-assisted extraction of pectin from orange peel. He has been an assistant professor at Integral University, Lucknow, for 3 years. He has published many papers on waste utilization in reputed journals. He is a passionate and dedicated researcher who aims to contribute to advancing food engineering and technology.

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Abbreviations

ACE	Angiotensin I Converting Enzyme
ALA	Alpha-Linolenic Acid
ATPS	Aqueous Two-Phase Systems
BMI	Body Mass Index
CAD	Coronary Artery Disease
CAGR	Compound Annual Growth Rate
CFD	Computational Fluid Dynamics
CIP	Clean-In-Place
CRM	Customer Relationship Management
CSR	Corporate Social Responsibility
CVD	Cardiovascular Diseases
CVP	Cost-Volume-Profit
D2C	Directly to Consumers
DES	Deep Eutectic Solvent
DHA	Docosahexaenoic Acid
DIAAS	Digestible Indispensable Amino Acid Score
EAA	Essential Amino Acids
EPA	Eicosapentaenoic Acid
FAO	Food and Agriculture Organization
FOP	Front-Of-Pack
GMO	Genetically Modified Organisms
GMP	Good Manufacturing Practices
GRAS	Generally Recognized As Safe
GWAS	Genome-Wide Association Studies
HACCP	Hazard Analysis Critical Control Points
HBA	Hydrogen Bond Acceptor
HBD	Hydrogen Bond Donor
HELENA	Healthy Lifestyle in Europe by Nutrition in Adolescence
HPAE	High Pressure-Assisted Extraction
IARC	International Agency for Research on Cancer
LDL	Low-Density Lipoprotein
MAE	Microwave-Assisted Extraction
MPS	Muscle Protein Synthesis
NCD	Non-Communicable Diseases

NSTEMI	Non-ST-Elevation Myocardial Infarction
OH	Ohmic Heating
PBD	Plant-Based Diets
PBP	Plant-Based Products
PDCAAS	Protein Digestibility Corrected Amino Acid Score
PEF	Pulsed Electric Field-Assisted Extraction
PTM	Post-Translational Modifications
QD	Quality by Design
R&D	Research and Development
RDA	Recommended Dietary Allowance
RM	Reverse Micelles
ROS	Reactive Oxygen Species
RTRS	Round Table on Responsible Soy
SCFA	Short-Chain Fatty Acids
SH	Sulfhydryl
STB	Stirred-Tank Bioreactors
STEMI	ST-Elevation Myocardial Infarction
T2DM	Type 2 Diabetes Mellitus
TALEN	Transcription Activator-Like Effectors Nucleases
TEF	Thermic Effect on Food
UAE	Ultrasonic-Assisted Extraction
USP	Unique Selling Propositions
VPP	Vegetable Protein Products
WHO	World Health Organization
ZFN	Zinc Finger Nucleases