Giving Food a Future

CELEBRATING 75th YEAR In the Service of Nation

Empowering the Food Professional

SOUVENIR

National Symposium

on

PLANT PROTEINS : STRUCTURE - FUNCTION, HUMAN NUTRITION, AND TECHNOLOGICAL ADVANCES

at

CSIR-Central Food Technological Research Institute, Mysuru-570020

Organizers

CSIR-Central Food Technological Research Institute (CSIR-CFTRI)

in association with

Association of Food Scientists and Technologists (India) (AFSTI)

July 25, 2025

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ಸಿ.ಎಸ್.ಐ.ಆರ್–ಕೇಂದ್ರೀಯ ಆಹಾರ ತಂತ್ರಜ್ಞಾನ ಸಂಶೋಧನಾಲಯ
सीएसआईआर-केन्द्रीय खाद्य प्रौद्योगिक अनुसंधान संस्थान
CSIR - CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE
Ministry of Science & Technology, Government of India
Cheluvamba Mansion, Opp. Railway Museum, KRS Road, Mysuru - 570 020

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डॉ. श्रीदेवी अन्नपूर्णा सिंह
निदेशक

Dr. Sridevi Annapurna Singh
Director

CSIR-CFTRI is currently in its 75th year of remarkable contributions to Food Science and Technology in India. We are commemorating this milestone with a series of scientific and academic events throughout the year. One of the flagship events is the **National Symposium on Plant Proteins: Structure-Function, Human Nutrition, and Technological Advances**, scheduled to take place at CSIR-CFTRI, Mysuru, on **July 25, 2025**.

Currently, India's dietary protein intake is dependent mainly on cereals such as rice and wheat, which contribute to nearly 60% of the total crop production and yield approximately 22.6 million metric tons (MMT) of protein. However, the protein quality of cereals, especially in terms of essential amino acids (EAAs), is relatively poor compared to animal-based sources. This heavy reliance has led to widespread protein deficiency, affecting an estimated 13 to 37.3% of the population across various age groups. To bridge this nutritional gap, there is a growing interest in alternative protein sources such as legumes, mushrooms, and single-cell proteins derived from microalgae, yeast, and bacteria.

This symposium aims to bring together leading scientists, technologists, industry professionals, and young researchers to exchange ideas and insights, and to explore the current landscape, emerging challenges, and future directions in plant protein research.

As someone deeply engaged in the field of plant proteins, it is truly a pleasure to witness such a symposium being hosted at CSIR-CFTRI. The Institute's contributions to meeting the country's plant protein needs are commendable. From pioneering baby food formulations in the 1960s to developing products like Balahara, Poushtic Atta, Miltone, energy foods, protein isolates and concentrates from various sources, high-protein sesame paste, soy-based products, protein-rich bakery items, and nutritional intervention products are the achievements as a result of the unwavering dedication of CFTRI's scientific and technical staff. I feel fortunate to have been a part of the team in some of these endeavors.

These efforts continue today, evolving to meet new-age demands of plant proteins in areas such as personalized nutrition, sports nutrition, therapeutic diets, infant formulations, and beyond.

I am confident that this symposium will not only celebrate the 75 glorious years of CSIR-CFTRI but also serve as a vibrant platform for knowledge-sharing and collaboration in the field of plant proteins. Let us all contribute to the success of this event and come together to celebrate it at the **Royal Mansion** in the **Royal City** of **Mysuru**.

Sridevi Annapurna S.

18th July 2025
Mysuru

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Message from Chairman, Organizing Committee

It is my proud privilege to write this message for the National Symposium on Plant Proteins: Structure–Function, Human Nutrition, and Technological Advances, scheduled to be held at CSIR-CFTRI, Mysuru, on 25 July 2025, which is co-organised by the AFSTI Mysuru. As CSIR-CFTRI celebrates its 75th year of significant contributions to Food Science and Technology in India, we are commemorating this Platinum Jubilee milestone with a series of scientific and academic events throughout the year. Among these, this symposium stands out as a flagship event of the celebrations. The symposium aims to bring together leading scientists, technologists, industry professionals, and young researchers to share knowledge and explore the current landscape, challenges, and future directions in plant protein research. Key focus areas of the symposium include: Structure–function relationships of plant proteins, Alternative or smart proteins, Therapeutic proteins and Protein-energy malnutrition.

The enthusiastic response from delegates representing a diverse range of sectors underscores the fundamental need and significance of this symposium. We take great pride in welcoming a distinguished lineup of speakers, each bringing a wealth of knowledge and experience that promises to enrich our event greatly.

A highlight of the symposium will be the Platinum Jubilee address, to be delivered by the esteemed Prof. H. S. Savithri, a renowned expert in her field. Additionally, attendees can look forward to engaging lectures from several eminent speakers, including Dr. V. Prakash, a leading expert on Food Science and Technology, Dr. Rekha Singhal, recognized for her innovative contributions to food science, Dr. G. Narahari Sastry, an influential voice in computational chemistry and biology, Dr. Vishwajanani J. Sattegiri, who is notable for her efforts in traditional knowledge, IPR and integrative research, and our esteemed Director, Dr. Sridevi Annapurna Singh, whose leadership has been pivotal in advancing CFTRI's vision and mission. The insights and experiences shared by these distinguished speakers will undoubtedly provide immense value to all attendees, fostering rich discussions and inspiring collaborative solutions that address the pressing challenges we face today.

The symposium also includes a dedicated **poster session**, providing a platform for young researchers to showcase their work and engage with renowned scientists, industry experts, and fellow students.
I am confident that this symposium will enhance awareness about the emerging needs and opportunities in the domain of plant proteins. This event not only commemorates 75 remarkable years of the CFTRI but also serves as a dynamic platform for fostering **knowledge-sharing, collaboration, and innovation** in plant protein research. Together, we can address global food security challenges and contribute to healthier, more sustainable diets worldwide.
My sincere appreciation to the **organising team** for their dedicated efforts in making this event a grand success.

Best regards,

Dr. Giridhar Parvatham
Chairman, Organizing Committee

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About CSIR-Central Food Technological Research Institute

CSIR-Central Food Technological Research Institute (CFTRI), Mysuru, is a premier R&D Institute devoted to Food Science & Technology under the aegis of Council of Scientific and Industrial Research since 1950.The primary objective of CSIR-CFTRI is to ensure the food and nutritional security of the country through science and technological interventions. CFTRI focuses research in technology development, engineering sciences, translational research along with food protection and safety. Development of cost-effective technologies targeted to small and medium scale enterprises, utilization of newer Agri-Resources and value addition for ensuring food security by innovative food processing methodologies, are the prime objectives of the Institute.

Over the years, CSIR-CFTRI has introduced numerous innovative products and processes to the market, aligning with cutting-edge R&D practices and evolving consumer lifestyles. Notable achievements include the development of Infant foods, Instant ready-mixes, Parboiling of Paddy, Healthy food formulations, and Superfoods. The societal interventions have empowered a large number of farmers by providing affordable and sustainable methods for value addition to agricultural commodities, contributing to rural economy and employment generation.

CSIR-CFTRI has been playing a significant role in promoting sustainable food processing by embracing circular economy principles, employing food analytics for safety, leveraging omics technologies, adopting agile and intelligent automation, and utilizing big data for the development of healthy foods. The institute also focuses on the development of food processing clusters, skill enhancement, soft interventions, and capacity building to foster entrepreneurship and support the growth of Micro, Small, and Medium Enterprises (MSMEs). Additionally, the institute operates resource centres in Hyderabad, Lucknow, and Mumbai, providing technical assistance to entrepreneurs in these regions. Through its digital platforms, including the Free Technology Portal, SME corner, Food Processing Machinery Portal (a B2B platform connecting suppliers and food entrepreneurs), Micro-entrepreneurs portal, and skill portal. CSIR-CFTRI has nurtured a significant number of entrepreneurs.

Over the years, the institute has developed more than 400 technologies in the form of products, processes, or equipment designs, which have been made available to over 4500 licensees for commercialization. CSIR-CFTRI is committed to developing green technologies that enhance efficiency, reduce post-harvest losses, introduce convenience, explore new sources of food products, expand human resources in the food industry, ensure affordable nutrition, and modernize infrastructure. It has obtained multiple patents and published research findings in reputable peer-reviewed journals. It has been at the forefront of nurturing skilled professionals for the development of the food industry. The institute offers various programs, including Post-Graduation in Food Technology, a Certificate course in Flour Milling, and skill development training for entrepreneurs and industry personnel. Currently, over 250 students are pursuing Doctoral studies in food and allied subjects.

For more details Visit: www.cftri.res.in

About Association of Food Scientists and Technologists (India)

The Association of Food Scientists and Technologists (India) [AFST(I)], established in 1957, is one of the largest professional and educational organizations, with around 5000 members - food scientists and technologists, across the globe with spread over 48 chapters across India. The major objective of AFST(I) is to stimulate and advance knowledge base on various aspects of Food Science and Technology by organizing National and International Conferences and bringing out technical publications. The association recognizes talent and excellence in the profession of Food Science and Technology by conferring various Awards and Fellowship.

AFST(I) membership is open to all food professionals engaged in academic, industrial and other related activities. It has a well-written constitution, which forms the backbone of guidelines by which the Head Quarters and Chapters are functioning through their elected Central Executive Committee (CEC) and Local Executive Committees (LECs) respectively. The election of Office Bearers to these committees, their powers and functions are part of the constitution. One of the fundamental duties of the Association is to bring together members on a platform along with the experts in the field not only from India but also from abroad, along with the captains of the industries to share the commonalities of the cutting-edge technology in today's changing scenario. It is in this context that the Association organizes the annual conferences ICFoST, which is attended by a large number of scientists, technologists, entrepreneurs, and it hosts an international conference IFCoN once in every five years. The two journals, the Journal of Food Science and Technology (JFST) and the Indian Food Industry Mag (IFI Mag) are the flagships of AFST(I) activities. Receiving of Indian Food Industry Mag (Print copy) and online access to Journal of Food Science and Technology (JFST) are being the privilege of an AFST(I) member.

More details Visit: www.afsti.org

About the Symposium

Currently, India's dietary protein intake is dependent mainly on cereals such as wheat and rice, which contribute to nearly 60% if the total crop production and yield approximately 22.6 million metric tons (MMT) of protein. However, the protein quality of cereals-especially in terms of essential amino acids (EAAs)- is relatively poor compared to animal-based sources. This heavy reliance has led to widespread protein deficiency, affecting an estimated 13 to 37.3% of the population across various age groups.

To bridge this nutritional gap, there is a growing interest in alternative protein sources, such as legumes, mushrooms, and single-cell protein derived from microalgae, yeast, and bacteria.

This symposium aims to bring together leading scientists, technologists, industry professionals and young researchers to share knowledge and explore the current landscape, challenges, and future directions in plant protein research. The symposium will focus on recent advancements in plant protein, covering a range of topics including;

- ❖ Structure-function relationships of plant proteins
- ❖ Alternate/Smart proteins
- ❖ Therapeutic proteins/Human Nutrition
- ❖ Advanced technological solutions for large-scale protein production

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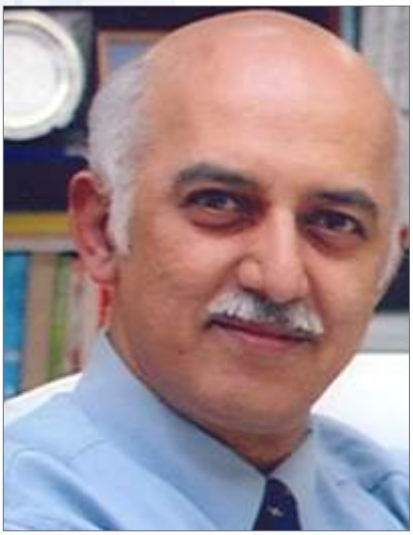
Technical Programme

Time	Event
8-30 to 9-30	**Registration** (Registration desk, near IFTTC auditorium)
9-30 to 10-00	**Inauguration of National Symposium on Plant Proteins** **Chief Guest** : **Dr. V. Prakash,** Former Director, CSIR-CFTRI and Distinguished Scientist, CSIR **Guest of Eminence** : **Prof. H.S. Savithri,** Former Professor, Dept. of Biochemistry, IISc, Bengaluru **Invited Speakers** : **Prof. Rekha Singhal,** Professor, ICT, Mumbai **Prof. G. Narahari Sastry,** Former Director, CSIR-NEIST, Professor, IIT, Hyderabad **Dr. Viswajanani J. Sattigeri,** Head TKDL and Chairperson SEC, CSIR **President** : **Dr. Sridevi Annapurna Singh,** Director, CSIR-CFTRI **About the symposium** : **Dr. Giridhar Parvatam,** Chairman, Organising Committee **Release of Souvenir by the Dignitaries**
	Invited Talks
11-50 to 12-25	**Prof. Rekha Singhal,** Professor, ICT, Mumbai Plant Proteins: So Near and Yet so Far!
12-25 to 13-00	**Prof. G. Narahari Sastry,** Former Director, CSIR-NEIST and Professor, IIT, Hyderabad Machine learning and AI applications in protein structure-function, drug discovery and healthcare
13-00 to 14-00	Lunch Break
14-00 to 15-00	**Poster session** - Quadrangle adjacent to Cheluvamba Hall
15-00 to 15-30	**Dr. Viswajanani J. Sattigeri,** Head TKDL and Chairperson SEC, CSIR Traditional foods and modern concepts on nutrition – Unity in diversity
	Special Lecture
15-30 to 16-00	**Dr. Sridevi Annapurna Singh,** Director, CSIR-CFTRI My Odyssey with Proteins for Nutrition, Functionality and Health
16-00 to 16-20	Tea Break
	Valedictory Function
16-20 to 17-30	**Chief Guest: Dr. A. G. Appu Rao,** Chief Scientist (Retd.) and Former Head, Dept. of Protein Chemistry and Technology, CSIR-CFTRI
17-30	High Tea

Invited Speakers

Platinum Jubilee Lecture



Dr. V. Prakash
Padmashree, Rajyothsava,
Bhatnagar and Several Lifetime
achievement Awardee
Former Director of CSIR-CFTRI, Mysuru and
Distinguished Scientist of CSIR, New Delhi

The Continuing Unique Global Saga of Plant Proteins @ Cheluvamba Campus.... *Yesterday, Today* and *Tomorrow*

The unique Saga of Plant Proteins etching a global impact with a National focus continues at CFTRI in the Cheluvamba Campus beginning 1950. Many firsts and many approaches focussed on protein remedies for nutrition maladies has been the hallmark of the Institute from Balahaar to Bhatnagar to Tsunami relief to hydrolysates to Homology to Peptides for health to Covid time Protection for tomorrow's Health and Wellness has a huge potential. Unravelling the Power of basic research for scaling up to Technology is the foundation of many links of the diverse varieties of Proteins is the hallmark of CFTRI as a game changer. Are we in the right direction and speed to dominate the world of plant proteins? Let us examine the potential and strategy for an AI architectural structure of plant proteins for Health and Wellness Globally for a Paradigm shift.

Platinum Jubilee Lecture

Prof. H.S. Savithri
Former Professor,
Department of Biochemistry
Indian Institute of Science,
Bengaluru

Decoding the Structure and Function of Plant Viral Proteins: Relevance to Plant Protein Research and Biotechnology

Viruses, with their small genomes, encode a limited number of proteins that exhibit remarkable structural versatility and multifunctionality. These proteins interact not only with each other but also with host factors to establish successful infection and pathogenesis. One intriguing strategy employed by many viruses is polyprotein processing, wherein a large precursor protein is cleaved by viral proteases into multiple functional units. Additionally, the presence of intrinsically disordered domains, which lack defined secondary structure, impart flexibility and enable these proteins to engage with diverse host targets and regulate various cellular processes.

Our work on plant viral proteinsincluding capsid proteins, proteases, movement proteins and other non structural proteins have provided novel insights into their structure-function relationships and their roles in the viral life cycle. These findings not only enhance our understanding of plant-virus interactions but also reveal potential targets for antiviral strategies. Bridging fundamental science with practical applications, our research has contributed to the development of rapid diagnostic tools, genetically engineered virus-resistant crops, and virus-based nanocarriershighlighting the immense biotechnological potential of plant viral proteins in agriculture and beyond.

Invited Speaker

Dr. Rekha S. Singhal
Professor of Food Technology
Institute of Chemical Technology
Nathalal Parekh Marg, Matunga,
Mumbai

Plant Proteins: So Near and Yet So Far!

Emerging trends to shift from animal-based bioeconomy to plant-based bioeconomy has channeled tremendous inputs from food scientists globally, both in the industry and academia in to developing products and processes that are economical and eco-friendly. In this context, the abundant availability of a wide range of plant proteins presents both opportunities in terms of expanding healthy and sustainable food basket as well as challenges due to structural dissimilarity of the said proteins, which is further enhanced in plant based products such as egg, milk, cheese, yoghurt and milk. Approaches to overcome these challenges by novel food processing techniques to impart functionality as well as novel food formulations, some new and emerging sources of proteins, and the implications of these alternatives from the perspective of potential consumers would be presented. Finally, some thoughts for the industry and policy makers would be shared for positive outcomes for all stakeholders.

Invited Speaker

Dr. G. Narahari Sastry
Professor, Department of Biotechnology,
Indian Institute of Technology Hyderabad,
Kandi, Telangana

Machine Learning and AI Applications in Protein Structure-Function, Drug Discovery, and Healthcare

The technological revolution being witnessed today largely owes to the emergence of Artificial Intelligence, and particularly machine learning, which has impacted both basic and applied sciences. The ability to ask scientific questions and probe the new technological space was greatly enhanced due to the new roads made by intelligent technologies. In this talk, I would like to focus on three areas: a) protein structure-function relationships, b) drug discovery and c) health care, and how these emerging technologies have metamorphosed the research practices in these fields.

The impact of the AI-driven technologies in hit and lead identification, lead optimization, animal and clinical trials will be analyzed with some illustrative case studies. Examples will be given where the top-niche human skills are being slowly replaced by machine learning and chatbots.

Drug discovery and healthcare appear to be two different areas, but AI and ML techniques are able to bring some unusual correlations between these areas. Some of the fundamental questions on aging, metabolic disorders, degenerative diseases, and geriatric care will be addressed. Importantly, how these questions can be effectively addressed by using AI and ML approaches will be explained.

Invited Speaker

Dr. Viswajanani J. Sattigeri
Head, CSIR-Traditional Knowledge Digital Library (CSIR-TKDL) Unit, New Delhi

Traditional Foods and Modern Concepts on Nutrition - Unity in Diversity

Humans relied upon natural resources for their health and wellness since time immemorial. Plants and animals were foods to the man. India has been an agrarian society with a sizeable population largely dependent on agriculture for their livelihoods. Despite changing times and industrialization amid global competition, agriculture still remains a crucial sector for not only livelihood generation but also for the food security of the country, while also supporting economic progress through industrial growth and trade. With its rich history and traditions, India is home to a wide variety of foods, the diversity of which is often linked to the local bioresources, nutrition and health of the people in the specific regions. World over, Indian foods with an extensive array of dishes, both vegetarian and non-vegetarian are considered delectable, often meeting the global plates and palates. Towards conserving and sustaining biological resources, and meeting industrial demands newer agri-food technologies are emerging. Traditional knowledge also happens to be key aspect of this growth, including its conservation and propagation.

The talk will cover aspects of Indian traditional knowledge on food and nutrition, while touching upon the protection of the knowledge, and the role that the Traditional Knowledge Digital Library (TKDL) plays in this important matter. The presentation shall also cover emerging aspects of food and nutrition, while also focusing on alternative proteins, from a patent landscape perspective. The emerging intellectual property (IP) trends in the food chemistry, technology and alternative proteins shall be highlighted. A brief on how traditional knowledge can be an important source of information for inspiring newer innovations in the domain shall be covered.

Special Lecture

My Odyssey with Proteins for Nutrition, Functionality and Health

Dr. Sridevi Annapurna Singh
Director, CSIR-Central Food Technological Research Institute, Mysuru

Plant proteins as food sources are in the limelight globally as consumers are desiring clean labels and share concern about sustainability. More and more consumers are preferring vegetarian and vegan lifestyles. The Plant-based Protein market is growing at a CAGR of 9.7% from 2021 to reach $23.4 billion by 2028. While the global market for plant proteins is increasing, the need for understanding ease of digestion, avoidance of allergens and their behaviour in the food matrix with other co-nutrients and during processing is important to avoid protein deficiencies. Proteins in their native state or modified during processing, play a significant role in food functionality. They react with co-nutrients in the food matrix, to desirable color, flavour, texture or act as emulsifiers and so on. Plant seeds like oilseeds, cereals and pulses have several small molecules that are recognized to have health benefits singly or in association with proteins. Proteins, during digestion, are broken down to peptides that are bioactive and have implications in health. Bioactive peptides with opioid, ACE inhibitory, antimicrobial activities have potential for use as nutraceuticals. These multipronged activities are exhibited through their ability to remove oxygen, scavenge free radicals, inhibit enzymes and affect gene expression. Small molecules, associated with proteins, in seeds are often known to have health benefits. My odyssey with proteins for the preparation of high protein ingredients and supplementary foods with increased digestibility, modification of proteins and food functionality by use of enzymes, mode of action of nutraceuticals like lignans and myricetin, in metabolic pathways, singly or in association with proteins, will be discussed. Nutritional intervention data, obtained using specific foods targeted at improving the nutritional status of children, will also be presented.

Poster Abstracts

PPS -01

Development of Freeze-Thaw Treated Linseed *(Linum usitatissimum)* Protein Isolate and its Characterization

Binanshu Talwar, Kusuma BV, and Rajni Chopra*
NIFTEM, Kundli
*Corresponding author email: **rajnichopra.niftem@gmail.com**

Objective: The present study aimed to optimize a process for developing protein isolates from freeze-thaw treated linseed oil cake and to characterize their structural and functional properties.

Methodology: Linseed oil cake was de-mucilaged using a hot water extraction method at 60°C for 4 h, followed by centrifugation and drying at 40°C. For freeze-thaw treatment, a novel pretreatment strategy to enhance protein extraction, samples were subjected to four cycles of freezing and thawing, with each cycle consisting of 6 h of freezing followed by 6 h of thawing. The combination of freeze-thaw cycles with enzymatic treatment using Viscozyme showed the highest protein yield. Additionally, enzymatic and ultrasonication methods were explored specifically for mucilage removal. Interestingly, these methods also contributed significantly to improved protein recovery, likely by enhancing matrix breakdown and protein accessibility.

Results and conclusion: UV-Visible spectroscopy confirmed the presence of aromatic amino acids, with shifts in absorption maxima indicating structural changes due to different treatments. Differential Scanning Calorimetry (DSC) revealed changes in thermal stability, with control samples showing sharp endothermic peaks, while treated samples exhibited broader peaks and higher denaturation temperatures, reflecting conformational modifications. Functional property analysis showed variations in solubility, emulsification, and foaming capacity, which were influenced by the pretreatment type. The study demonstrated that freeze-thaw pretreatment when combined with enzymatic or ultrasonication methods, effectively removes mucilage and enhances protein yield to improve the functional potential of linseed protein isolates for use in food and nutraceutical applications.

PPS -02

Optimization of Ultrasound-Enzyme Assisted Extraction and Characterization of Bio-Functional Proteins from Red Seaweed *Gracilaria corticata*

Inumala Chandini[1,3], Mamatha SS[2] and Tanaji G. Kudre[1,3*]
[1]Department of Meat & Marine Sciences, [2]Department of Food Protectants & Infestation Control
CSIR-Central Food Technological Research Institute, Mysuru-570020
[3]Academy of Scientific and Innovative Research (AcSIR), Ghaziabad
*Corresponding author email: **tkudre@cftri.res.in**

Objective: To optimize and characterize the bio-functional proteins extracted from red seaweed using ultrasound-enzyme assisted extraction.

Methodology: The optimization for extracting bio-functional proteins from red seaweed was performed by adopting a five-level-three-factor (enzyme concentration (%), time (h) and temperature (°C)) central composite design of response surface methodology. The extracted proteins (PE) were subjected to physicochemical and functional characterization.

Results and conclusions: The maximum protein content (66.56%) and protein yield (33.98%) were obtained at 4% enzyme concentration, 3h extraction time and 50°C temperature. FTIR spectra revealed that the parallel β-sheet is the major secondary structure. SDS-PAGE showed dense protein bands at 20 and 31kDa, corresponding to α/βand γ subunits of phycoerythrin. Further, valine, isoleucine, and lysine were found to be predominant essential amino acids whereas IVPD and iron content were found to be 75.2% and 76.43 mg/100g, respectively. PE exhibited the highest protein solubility (91.69%) with good emulsion and foaming properties at a wide range of pH (2 to 12) and excellent DPPH, ABTS and FRAP (5.06, 62.49 and 9.03 µM TE/mg, respectively) antioxidant activities. Therefore, the results of the present study endorsed that seaweeds can be a sustainable bio-functional alternative protein source that can be explored in the food industry.

PPS -03

Formulation of Protein Based Nutrition Rich Fat Spread

Chathur K.N., Rajeshwari G. and Chethana R*
Traditional Foods and Applied Nutrition Department
CSIR-Central Food Technological Research Institute
*Corresponding author email: **chethanar.cftri@csir.res.in**

Objective: This study investigates the formulation of fat-based protein spreads variations developed using solute-oil phase method.

Methodology: The physicochemical, functional, antioxidant, and sensory characteristics were studied for both the spreads.

Results and conclusion: The protein spreads displayed high protein content (~36%)and substantial fat levels (55–58%), indicating their suitability as energy-dense, protein-richfoods. The spicy spread showed lower moisture (1.85%) and water activity (0.30), along with higher viscosity (13120 cP), firmness (0.129 N), and an antioxidant activity value (23.56%DPPH inhibition), which collectively enhanced its oxidative stability and shelf life. On the other hand, the sweet spread, with slightly higher moisture (2.39%) and lower viscosity (9600cP), was easier to spread and smoother in texture, but showed a greater tendency toward oxidation and off-flavour development over time. Sensory analysis revealed greater consumer preference for the spicy variant, attributed to its vibrant appearance, intense flavour, and well-balanced profile. While the sweet spread was appreciated for its smoothness and sweetness, it received lower overall acceptance due to instability. Overall, both products serve as effective protein-enriched spreads, with the spicy variant demonstrating superior storage stability and sensory appeal for those favouring savoury options, and the sweet variant offering advantages in texture for consumers preferring milder taste profiles.

PPS -04

Optimization of Processing Parameters for Preparation of Ready-to-Eat Pearl Millet Flakes

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Objective: The study aimed at optimization of processing parameters for the preparation of Ready-to-Eat pearl millet flakes and checking its utilization in a composite Nutri-Bar formulation.

Methodology: Instant pearl millet flakes were prepared through sequential hydrothermal and mechanical processing, and characterized for their nutritional (proximate composition, *in-vitro digestibility*), techno-functional (hydration, pasting, texture), and molecular (FTIR) properties. The flakes were incorporated in the formulation of a Nutri-Bar and their sensory attributes were evaluated using a 9-point hedonic scale.

Results and conclusions: Sequential hydrothermal-mechanical processing adopted in the pearl millet flakes showed a significant reduction in the phytate (~33%) and tannin (~50%) content. This led to an increase in *in-vitro* protein digestibility and the bioaccessibility of iron, calcium, and zinc by 6.8-fold. Furthermore, the process imparted desirable techno-functional properties, notably a 153% and 54% increase and a 30% decrease in water-holding capacity, rehydration ratio, and oil-holding capacity, respectively, indicating its suitability for low-fat instant product formulations. Molecular modifications were observed in the FTIR spectrogram. The acceptability of the flakes was found to be good, with an overall acceptability score of 7. 100 g of flakes-incorporated Nutri-Bar meets around 39% of the RDA of protein, 15% of iron, and 12% of zinc for adult Indians.

PPS -05

Arabidopsis AT5G18630 Encodes a Triacylglycerol Lipase that Facilitates Lipid Mobilization During Seed Germination

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Objective: To identify and functionally characterize seed-specific lipases involved in lipid metabolism to enhance oil accumulation in seeds.

Methodology: Arabidopsis seeds were grown, and RNA was extracted for cDNA synthesis. AT5G18630 was cloned, expressed in *E. coli* and yeast, and purified. Protein expression was confirmed by western blot and MS/MS. Activity-Based Protein Profiling (ABPP) was performed to confirm active lipase functionality and specificity. Lipase activity was assessed using *in vitro* enzyme assays using lipid substrates and ABPP labeling.

Results and conclusion: Activity-based protein profiling (ABPP) verified that AT5G18630 is an active serine hydrolase. Competitive ABPP revealed a preference for TAG substrates, especially C12:0 and C16:0, while exhibiting insensitivity to classical lipase and esterase inhibitors. *In vitro* assays demonstrated that the purified protein hydrolyzed TAGs in a time and protein-dependent manner, with optimal activity at 40°C and pH 8. Over expression in the yeast *tgl3*Δ*tgl4*Δ*tgl5*Δ mutant resulted in reduced TAG levels and elevated free fatty acid (FFA) content. Phenotypic and expression analyses of at5g18630 mutants revealed early developmental changes and sustained gene expression during germination and early seedling growth. SDP1, a major TAG lipase, showed high early expression that declined post-germination. AT5G18630 appears to function in a complementary capacity, facilitating residual lipid mobilization through a temporally distinct and non-redundant pathway.

PPS -06

Formulation and Characterization of High-Protein Cookies Enriched with Defatted Groundnut Seed Cake

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Objective: This study aimed to formulate high-protein cookies by incorporating defatted groundnut seed cake (DGSC), a protein-rich agro-industrial by-product of oil extraction, as a partial substitute for wheat flour. The objective was to enhance nutritional value while promoting the sustainable utilization of food processing residues.

Methodology: Cookies were formulated at varying substitution levels (20%, 30%, and 40%),among these 30% DGSC, both with and without emulsifier, were found to be acceptable and were further evaluated for proximate composition, physical properties, sensory quality, and shelf stability.

Results and conclusion: A notable increase in protein content from 19.82±1.94% (control) to 23.41±1.93% (DGSC cookies) and 23.13±1.70% (with emulsifier) was observed. Fat and energy values also increased, reaching up to 29.47±0.36% fat and 526.41±1.72 kcal/100g, indicating improved nutrient density. Texture analysis revealed enhanced hardness and fracturability in DGSC cookies with emulsifiers. Shelf-life studies (75 days) confirmed stable water activity (<0.5), acceptable peroxide values, and minimal changes in texture and color. The findings validate DGSC as a functional, sustainable ingredient for protein-enriched baked products, supporting nutritional enhancement and agro-industrial by-product utilization in line with food system sustainability goals.

PPS -07

Characterization of *Prosopis cineraria* Seed Flour and Protein Isolation Using Enzyme-Aided Alkaline Method

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Objective: To characterize the proximate, functional and thermal properties of *Prosopis cineraria* seed flour and to evaluate the efficiency of enzymatic-assisted alkaline extraction for isolating protein from the seeds.

Methodology: Proximate composition, functional properties and thermal properties of the seed flour were carried out. For protein extraction, seeds were milled into the flour. An enzyme-assisted (cellulase, amylase and pectinase) alkaline extraction method was used. After enzymatic hydrolysis, enzymes were inactivated. The slurry was then adjusted to Ph between 9-11 and centrifuged. Supernatant was collected and precipitated by adjusting ph between 4-5 (isoelectric point) and again centrifuged. Precipitate collected and freeze dried for further use.

Results and conclusion: *P. cineraria* seed flour has moisture 6.7%, ash 6.2%, fat 1.6%, protein 21.2%, fiber 18.4%, and carbohydrates 45%. At 23, thermal conductivity was 0.1106 W/mK, diffusivity 0.2333 m^2/s, and specific heat 0.4781 MJ/m^3K. *Prosopis cineraria* seed flour showed water absorption 3.88 g/g, oil absorption 2.12 g/g, emulsion activity 68.12%, stability 92.39%, foaming capacity 22.67% and stability 98%. The protein of the flour was extracted using enzyme assisted alkaline (pH 11) extraction method using combination of cellulase, amylase and pectinase. Purity of extracted protein was 51.95%.

PPS -08

Formulation and Characterisation of a Ready-To-Drink Plant-Based Beverage for Toddlers

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Objective : To formulate a ready-to-drink, plant-based beverage for toddlers (1–3 years), and its chemical characterisation.

Methodology : Whole grains of wheat, ragi, and groundnut were soaked for 6 hours and sprouted at room temperature for 12-24 hours, depending on grain type. while coconut and barley were used in their native form. The sprouted grains were dehulled and de-vegetated where applicable, then finely ground using a 1:5 grain-to-water dilution ratio. The ground mixture was filtered through fine mesh cloth, which was then homogenised, pasteurised and bottled. The multi-grain beverage was chemically characterised using standard protocols.

Results and conclusion: The study found that among individual sources, groundnut (3.2 g/100ml) and coconut (1.66 g/100ml) offered the highest protein levels but lacked sufficient micronutrient density. Blending improved the overall nutritional profile: protein (1.05–1.60 g/100ml), calcium (2.53–4.23 mg/100ml), iron (0.32–0.55 mg/100ml), and zinc (0.10–0.14 mg/100ml). *In vitro* protein digestibility ranged from 50–57%, and the beverage had a low glycemic index (40). A 250 ml serving met approximately one-third of the RDA for toddlers, supporting its potential as a plant-based nutritional supplement for early childhood.

PPS -09

Formulation and Quality Characteristics of a Ready-To-Eat-Snack Product Suitable for the Geriatric Population

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Objective: To develop a ready-to-eat snack for the geriatric population with adequate protein and micronutrient content and to evaluate its physico-chemical properties.

Methodology:A ready-to-eat snack was formulated using cereals and pulses, and fortified with essential micronutrients namely, iron, calcium, and zinc. Proximate composition was determined using standard AOAC methods. Physical properties such as colour, texture, and bulk density were evaluated. Functional properties, including pasting profile, swelling index, solubility, water-holding capacity, and oil-holding capacity were assessed. Nutraceutical properties such as antioxidant activity and polyphenol contents were analysed.

Results and conclusion: The product contained14.7 gof protein, 6.5 g of fat, 3.56 g of minerals, 66.42 g of starch and 6.5 mg of iron, 387 mg of calcium, 4.0 mg of zinc per 100 g of the sample. The product contained 9.33 g of total dietary fiber with 3.22 g of soluble and 6.11 g of insoluble fractions per 100 g. The protein digestibility was 78%. Pasting properties revealed a significant reduction in viscosity parameters. The product contained 329.209 mg (GAE)/100g of total polyphenols and 42.81 mmolAAE/gof total antioxidant activity.

PPS -10

Valorization of Sunflower Seed Meal and Dietary Fiber Fraction for Smart Food Protein Applications

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Objective: To evaluate the nutritional quality, protein digestibility, and functional properties of sunflower protein isolates obtained from solvent-extracted and cold-pressed meals for food applications.

Methodology: Cold-pressed sunflower seed cake (8–10% residual oil) was sourced from a local industry and defatted to <2% fat. A pilot-scale solvent-extracted meal was prepared for comparison. Protein isolates were obtained using alkaline solubilization followed by isoelectric precipitation. Proximate composition, Fourier-transform infrared (FTIR) spectroscopy, in vitro digestibility, and functional properties like water absorption capacity (WAC), oil holding capacity (OHC), foaming capacity (FC), and emulsion stability index (ESI) were evaluated.

Results and conclusion: Defatted meals contained 52% (solvent-extracted) and 56% (cold-pressed) protein, with digestibility of 85% and 72.6%, respectively. Isolates had 86-88% protein and digestibility of 92-96%. Cold-pressed protein isolate (PPI) showed higher WAC (3.05-3.32g/g), OHC (1.27-1.32□g/g), FC (80%), and ESI (32.1-54.6□min) than commercial protein isolate (CPI). FTIR analysis revealed structural variation. The fiber-rich by-product had 28.9% protein and acceptable dietary fiber. While defatted flour (L* 77.59) was acceptable, isolates and fiber fractions exhibited undesirable green color due to chlorogenic acid, posing sensory challenges for food applications.

PPS -11

Efficacy of a Plant-Based Complementary Food to Alleviate Protein-Energy Malnutrition in Rat Model

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Objective: To study the efficacy of a plant based complementary food in recovery of protein energy malnutrition (PEM) in rats.

Methodology: A plant-based complementary food (CF) containing cereal, pulse, and oilseed flours was formulated and characterized. The efficacy of the CF was tested in a PEM induced rat model. Weanling rats were divided into three groups: control (AIN-93 diet), CF-fed, and PEM-induced (low-protein diet for 4 weeks). On deficiency induction, rats were subdivided into two groups and one group was fed with AIN-93 diet and other with CF for a period of 8 weeks. Growth, selected biochemical parameters and gut microbiome composition were analyzed.

Results and conclusion: The formulated CF, containing 18 g protein with an *in vitro* digestibility of 88.1 % and 431 Kcal. On replenishment, significant improvement was noticed in body weight and length of PEM induced rats was comparable to the control group. The plasma protein (3.1 g/dl) and serum albumin levels that had lowered in PEM rats was normalized post-supplementation. Gut microbiome composition with *Firmicutes*-dominated dysbiosis observed in PEM rats. On dietary supplementation, the microbial balance was observed, with the PEM-CFM group showing a significant recovery with *Bacteroidetes* at 61%, and *Firmicutes* decreasing to 30%, closely aligning with healthy control rats.

PPS -12

Extraction and Characterization of Protein Isolates from Rice-Based Distiller's Dried Grains with Solubles (DDGS)

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Objective: To valorize rice-based distiller's dried grains with solubles (DDGS) through the extraction of protein isolates for potential functional food applications.

Methodology: Rice DDGS, obtained from two distilleries, was ground, sieved, and defatted using hexane. Protein extraction was performed via enzyme-assisted alkaline solubilization using cellulase and protease. The process was optimized through Response Surface Methodology (RSM), considering enzyme concentrations and temperature. Proximate analysis and functional assessments-including water holding capacity (WHC), oil holding capacity (OHC), solubility, emulsification, and foaming-were conducted. Structural and physicochemical properties were characterized using FTIR, UV–Vis spectroscopy, zeta potential, particle size distribution, and DSC. Antioxidant potential was evaluated by DPPH and total phenolic content (TPC) assays.

Results and conclusion: The optimized extraction condition (0.4% cellulase, 0.4% protease at 70°C) yielded a protein isolate with 24.29% recovery and 89.93% purity. Optimized sample exhibited significantly improved WHC (388.91%) and OHC (289.12%), along with higher solubility at acidic pH. FTIR and UV–Vis spectra indicated structural modifications, and DSC analysis revealed enhanced enthalpy, suggesting stable intermolecular interactions. Particle size and zeta potential results confirmed morphological changes. The findings demonstrate that rice DDGS can serve as a valuable source of functional protein for food applications, promoting sustainable utilization of agro-industrial by-products.

PPS -13

Spirulina platensis - A Potential Alternative Protein Source for Food Flavours

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Objective: To enhance the consumption of *Spirulina* with the development of a flavour portfolio and to evaluate its potential as a functional ingredient in snack seasonings and in developing protein-rich bakery products such as cookies.

Methodology: *Spirulina* biomass was treated with different proteases and resulting spray-dried biomass was evaluated for its biochemical characteristics, including protein content, amino nitrogen, etc. Six different savory flavour prototypes have been developed and evaluated as seasonings on crisps and as an ingredient in cookies.

Results and conclusion: *Spirulina plantensis* is widely recognized for its high protein content in the range of 55 to 65% on CDW. Proximate analysis was performed, which showed values within standard DV ranges, confirming its strong nutritional profile. Despite of its nutritional profile, consumption is not widely practiced as it is known to decrease the organoleptic properties of food because it imparts off-flavors. To promote the consumption of *Spirulina* in a wide variety of food formulations, the biomass is enzymatically treated, which is commercially used for the production of food flavours. Tasting sessions were conducted to assess flavour attributes such as umaminess, juiciness, mouthfulness, salt perception, lingering, and salivation, which were ranked on a hedonic scale, indicating potential hydrolysis and release of peptides and amino acids.

PPS -14

Comparative Study on Biochemicals and Antioxidant Activity in Mycelium and Fruiting Bodies of *Cordyceps militaris*

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Objective: To compare the biochemicals and antioxidant content of *Cordyceps militaris* grown in different media.

Methodology: *Cordyceps militaris* was grown in modified liquid and solid media. The liquid media was enhanced with amino acids, that can serve as key precursors for protein synthesis. For the solid-state cultivation, the substrate was modified to enhance the growth of *Cordyceps militaris* fruiting bodies. Qualitative and quantitative analyses after reflux extraction were then carried out. The major bioactive compound, cordycepin, was extracted and calculated by a UV spectrophotometric method. Finally, the antioxidant activities of the extracts were assessed.

Result and conclusion: Protein content was found to be considerably higher in dried mycelia (0.556 ± 0.006 mg BSA/g) than in dried fruiting bodies (0.369 ± 0.008 mg BSA/g). Apart from protein, the mycelium also has higher levels of total phenolics and cordycepin (MY:5.5 %, FB:1.6%). In comparison, the fruiting bodies have higher levels of carbohydrates, reducing sugars, carotenoids, and antioxidants. The findings indicate that the mycelium and fruiting bodies are suitable for various nutraceutical or functional food applications, mycelium for higher protein and cordycepin, and the fruiting bodies for higher antioxidant activity and carbohydrate content.

PPS -15

Smart Proteins from Underutilised Dryland Crops: Optimization of Extraction Methods, Functional Characterisation and Productizations

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Objectives: Addressing malnutrition and climate change by development of smart protein ingredients and foods from sustainable local dryland crops.

Methodology: Considering that local millets and pulses have complementary balanced amino acid profile storage proteins and functionality needed to formulate 'Smart protein products', promising high protein and yielding varieties were selected for extraction of smart proteins using an in-house nutrient-functionality relationships-based Response Surface Methodology model. Dry classification, wet extraction and drying were optimised to extract proteins, and the protein fractions characterised for quality and functional properties. The extracted protein ingredients were further prototyped as egg-replacers and minimally processed RTC high-protein flours.

Results and conclusion: High protein, yield and desirable functional properties containing varieties were selected. Dry classification yielded protein and micronutrient-rich fractions in finger millet (18 %-19%), chickpea (29%) and pigeonpea (24-25%)utilisable as RTC nutritious high-protein flours. Wet extraction -spray/freeze drying yielded essential amino acids rich concentrates(up to 70 %), with significant variability in functional properties, with diverse application potential. The study demonstrates resilient dryland crops as sustainable nutritious proteins, blends and food source, highlighting further need for structure-function characterisations for diverse consumer and industry-preferred food-systems. Scale-up to affordable platforms would expedite main streaming of the sustainable millets and legumes impacting nutrition, health, and livelihoods of smallholder communities.

PPS -16

Variations in the Amylase Expression and Activity During the Malting of Browntop Millet (*Urochloa ramosa* (L.) T.Q. Nguyen)

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Objective: To evaluate the impact of malting on the expression and activity of α-amylase in browntop millet *(Urochloa ramosa (L.)* T.Q. Nguyen).

Methodology: Browntop millet (HBr-2) grains were cleaned, soaked overnight, and germinated for 4 days (96h) at 37°C in a BOD incubator. The germinated grains,collected at every 24h, were dried, milled into flour, and analyzed for malting loss and expression and activity of amylases. Amylase activity was measured by quantifying the reducing sugarby DNS method (maltose equivalents). The protein(s) exhibiting amylase was visualized by zymogram.

Results and conclusion: Malting loss was maximum at 96h (30.22%). Malting increased the carbohydrate content by ~4.25 folds (0.05% to 0.21%), reducing sugars by ~2.8 folds (0.3% to 0.86%) and proteins by ~22 folds (0.01% to 0.22%). Activity of amylase was found maximum at 72h with 137.80 mg/mL of maltose/mg protein/h at 45C in comparison to the native sample, which produced about 32.80 mg/mL of maltose/mg protein/h at 45C. In-gel zymographic analysis and coomassie staining revealed two prominent bands, indicating the presence of distinct isoforms of the enzyme. The malting may enhance the nutritional value and antioxidant content of browntop millet. The study identifies malted browntop millet as a natural amylase source that promotes starch digestion, making it suitable for formulating energy-dense malt and malt-based food products.

PPS -17

Application of Protein-Rich Powders from Agri-Waste Grown Mushrooms as Blend Components with Plant Proteins to Improve their Structuring Characteristics in Extrusion and Deliver a Nutritionally Superior Structured Protein

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Objectives: To deliver protein-rich mushroom powders with complementary amino acid profile to plant proteins. To deliver mushroom powders with high umami taste through controlled heat exposure during extrusion. To enhance vitamin D levels in mushrooms by controlling exposure to light. To deliver structured proteins with high protein digestibility by combining plant protein concentrates with dried mushroom powders having high umami taste & high Vitamin D levels.

Methodology: Pleurotus species mushrooms were cultivated on ligno-cellulosic agro waste substrates such as ragi straw, rice straw and wheat straw. The mushroom biomass was dried, milled and the powder was blended with plant proteins to obtain a quality amino acid composition. The blend was extruded under high moisture conditions to structure the proteins and evaluated for texture, and in vitro digestibility using simulated gastrointestinal models.

Results and conclusion: The yield of mushroom was in the range 500 g to 1000 g frsy weight of mushroom/kg dry weight of straw. The use of protein-rich mushroom powders as blended components with plant proteins represents a functional, and nutritionally intelligent approach to overcoming current limitations in alternative proteins. The approach supports a circular economy by using lignocellulosic waste for mushroom cultivation, while addressing micronutrient gaps for Vitamin D and sensorial challenges associated with plant proteins by contributing umami character.

PPS -18

Ancient Grain Integration in Waffle: Improving Protein and Other Nutritional Values

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Objective: To study the influence of ancient grains (proso millet, amaranth, oats) on the protein content and nutritional profile of the waffle.

Methodology: Waffles were prepared by partial replacement of refined wheat flour with the composite mixture of the flours of the three grains at different percentages. The effect of the composite mix on the processability of the waffle, physical, textural, sensory and nutritional properties was investigated.

Results and conclusion: The physical characteristics of waffles indicated that, with the increase in the addition of composite mix, the weight of the waffles decreased (135 to 115 g). The crust colour became darker with a decrease in lightness value (48.4 to 31.5), increase in redness value (8.39 to 10.55). The texture profile analysis of waffles indicated that, a significant decrease in the hardness (4531 to 1984 gf), springiness (98.3 to 90.5%). There is decrease in moisture content from 27.8% in control and 24.4% in product. The protein content of the waffle ranges between 9.55% in control to 11.22% in the product and the fat percent is 4.6% in control and 6.36% in product. The values for the total dietary fibre are 7.45% in control and 9.82% in product. The mineral content has shown an increase in the product compared to the control sample. The current study shows that the integration of ancient grains has improved the nutritional value.

PPS -19

Technological Innovation and Nutritional Enhancement of Pasta with High-Protein Soybean Semolina

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Objective: To develop high-protein pasta using soybean semolina and to evaluate its effects on pasta-making properties and nutritional quality.

Methodology: Soybean grains were processed into semolina using standardized roller milling parameters. Pasta was developed with 50% soybean semolina incorporation, and subsequently assessed for pasta-making properties and nutritional qualities.

Results and conclusion: The study demonstrated that full-fat soybean semolina with a uniform size, comparable to durum semolina, can be used to develop high-protein pasta. Initial optimization and sensory evaluation revealed that replacing up to 50% of durum semolina with soybean semolina yields pasta with desirable quality. Pasta made with control soybean semolina (CSP) exhibited a higher hardness (295.21±3.50) than durum semolina pasta (DSP), while hydrothermally treated soybeans semolina pasta (HSP) showed reduced hardness. The incorporation of soybean semolina maintained the characteristic yellow hue of durum pasta, with values ranging from 14.43% to 16.59 %. Although Soybean pasta had a slightly higher cooking loss, all values remained within acceptable limits. Soybean pasta exhibited higher protein (28.11±0.12%) and total dietary fiber (11.23±0.26%) contents. Increase in total polyphenol and mineral content were also observed in soybean pasta.The study demonstrated that up to 50% of durum semolina can be replaced with soybean semolina to produce high-protein pasta without compromising quality, offering added health benefits.

PPS -20

Development and Quality Evaluation of Ready-To-Eat Extruded Snack Based on Millets and Niger (*Guizotia abyssinica* L.) Seed Protein Extract

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Objective: Todevelopa ready-to-eat extruded snack using millets and Nigerseed protein.

Methodology: Niger seeds protein extract was prepared by defatting seed flour and mixed with proso millet flour, conditioned with appropriate moisture and extruded using single screw extruder. The product was coated with honey and jaggery for improving the taste.

Results and conclusion: The standardized composition for development of ready to eat extruded snacks was Niger seed protein extract, 10% corn flour, 30% and Proso millet 60%. The single screw extruded and tray drier conditions were optimized as 160℃ 170℃ and 180℃ at zone 1, zone 2, zone 3, respectively; die diameter 4mm and screw speed was 20 rpm. Niger seed protein extract and ready to eat extruded products were found to be rich in protein (26.42 and 10.37%) and fiber (47.92 and 5.30%). The extruded product was found to be rich in fibre (5.3%), total polyphenols (66 mg/100g), iron 16 mg/100g and energy 316 Kcal/100. IC50 (Inhibition of DPPH free radical by 50%) was observed at a concentration of 4.3 mg/ml and for ABTS radical at 33 mg/ml. The extruded products were acceptable, non-hygroscopic and microbiologically safe for 3 months of storage.

PPS -21

Physiological Properties and ACE Binding Mechanism of Phycocyanin-Derived Peptides from *Spirulina*

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Objectives: The study aims to examine the sequence and physiological properties of *Spirulina (Arthrospira platensis)*, a cyanobacterium, contains C-phycocyanin and allophycocyanin, water-soluble, and highly fluorescent phycobili proteins, derived proteins using ExPASy ProtParam tool and the molecular interaction of phycocyanin derived peptides with angiotens in converting enzyme (ACE).

Methodology: The amino acid sequence of *spirulina* proteins obtained from UniProtKB database and physiological properties was studies using EXPASy ProtParam tool and further the program ExPASy PeptideCutter was used to hydrolyze C-phycocyanin, to predict cleavage sites cleaved by proteases followed by AutoDock Vina tool was used for docking simulation studies.

Results and conclusion: In the current study, five peptides SPSW, RMVTY, IDY, SHGL, QRF, NTY showing Peptide Ranker scores higher than 0.5 were therefore predicted to have good biological activity. Therefore, molecular docking showed that the five peptides formed hydrogen bonds and hydrophobic interactions with the key groups in ACE active pockets, and the binding affinities between SPSW and ACE were similar to positive control Fosinopril. Phycocyanin derived peptides have a greater potential in food industry as a natural functional food pigment. This study provides guidance for the development of C-phycocyanin-derived peptides as ACE inhibitors.

PPS -22

Development of High Moisture Meat Analogues from the Blends of Legume & Cereal Proteins for Improved Textural & Amino Acid Profile

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Objective: Combinations of three legume protein isolates (soy, pea & mung) with two cereal protein isolates (wheat gluten & rice) in two different ratio were studied for their amino acid (AA) profile & texture characteristics when extruded under high moisture conditions for high moisture meat analogue (HMMA) applications.

Methodology: Different protein isolates were procured from market and twin-screw extruder was used for HMMA development. Texture analyser was used for texture analysis and HPLC was used for identification of AA profile as well as multi-enzyme system was used for the evaluation of digestibility of the developed HMMA.

Results and conclusion: Blending cereal proteins > 30% resulted in deterioration in texture. Among all single extruded protein had high springiness values ranging from 0.85 to 0.92 with gluten showing highest springiness. Moong with rice protein blends showed the highest hardness above 600 N among all blends. These results provide insights on blending the various proteins to achieve high AA scores and sufficient manoeuvrability to design HMMA for whole meat applications with textures to suit different meat dishes & cultural preferences. Result showed that extrusion slightly (3-5 %) improved in digestibility of the HMMA, when compared with raw proteins.

PPS -23

Development and Characterisation of Partially Baked *Chapati* Incorporated with Plant Proteins

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Objective: To develop partially baked *chapati* enriched with jackfruit*(Artocarpus heterophyllus)* seed flour (JFSF) in order to enhance their physicochemical, nutritional, and sensory attributes.

Methodology: The present study evaluated the effects of incorporating JFSF at varying proportions, along with defatted soybean flour (SF) and sprouted green gram flour (GGF), as partial replacements for whole wheat flour in the preparation of partially baked *chapati*. The formulations were analyzed for their physicochemical, functional, microstructural, and sensory properties.

Results and conclusion: Incorporating jackfruit flour into composite flours for partially baked *chapati* improved nutritional value, raising protein (20g) and iron (26mg) levels, along with higher polyphenols and antioxidant activity. Control *chapati* had the highest lightness (L*), with stable b* values across samples. Scanning Electron Microscopy (SEM) showed starch granules in a protein matrix, and Fourier Transform Infrared (FTIR) confirmed functional groups. Formulated *chapati* had increased firmness and toughness but retained acceptable sensory quality, though control scored higher. The improved nutrient profilefulfill a significant portion of protein and iron RDA in preadolescents.

PPS -24

Functionalization of Zein (a corn protein) for Coating Applications on Bell Pepper (*Capsicum annuum L.*)

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Objective: Functionalization approaches for corn protein "Zein" to mitigate its hydrophobic characteristics and improve its utility in the preservation of fruits and vegetables.

Methods: Zein was solubilized in various concentrations of ethanol.The solution was functionalized by applying different moles of NaOH. Spec and SDS-PAGE were then used to quantify the total protein. SEM used to validate the surface morphology. The bell pepper was coated with the proper functionalized solution. For 20d, weight loss and firmness were recorded at 5oC.

Results and conclusion: Dissolution of zein was achieved with 80% of ethanol.A 0.01M NaOH was optimal for zein functionalization. SEM resulted smooth morphology with uniform distribution and without flocculation at the 80% ethanol/0.01M NaOH condition is a significant finding that demonstrates successful functionalization. The difference in firmness coated fruits maintained 5N compared to 1.25N for uncoated fruits by 20d represents exceptional performance (200%). Significant weight loss differences were observed until 20d in coated and uncoated fruits. After 20d the uncoated fruits started deterioration by microbial growth and cell dismantling. This study demonstrates that the combination of 80% ethanol and 0.01M NaOH provides an effective method for zein functionalization, resulting in high-quality coatings with excellent fruit preservation properties and this approach has significant potential for commercial food preservation applications.

PPS -25

Influence of Rice Bean Flour Incorporation on the Rheological, Physicochemical & Sensory Properties of Pizza Base

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Objective: To develop protein-enriched pizza bases and evaluate their rheological, physico-chemical, and sensory properties.

Methodology: Part of whole wheat flour (WWF) was replaced with rice bean flour (RBF) at varying proportions to form a pizza base (PB) and was compared to WWF PB. The effect of incorporation of RBF on the rheological properties of flour, textural, physicochemical and nutritional properties of PB was evaluated.

Results and conclusion: The research findings indicate that the flour water absorption capacity decreases from 75% to 64.2% with the incorporation of RBF. Physically, the pizza bases showed reductions in thickness, shear force, lightness, and yellowness values, and an increase in redness values with increasing RBF content. Sensory evaluation revealed that crust colour slightly darkened with RBF incorporation, and acceptable sensory attributes were maintained with the incorporation of RBF without significant surface cracks or hardness. The in-vitro starch digestibility was decreased from 34 to 31, indicating slow release of glucose to blood, and the in-vitro protein digestibility of PB increased from 63 to 84. These findings suggest that the RBF incorporated pizza bases could be a valuable addition to the diet for individuals managing a healthy lifestyle.

Poster Presenting Authors Index

ASSOCIATION OF FOOD SCIENTISTS & TECHNOLOGISTS (INDIA)

CSIR-CFTRI Campus, Mysuru - 570 020, Karnataka, India

The Association of Food Scientists and Technologists (India). [AFST(I)] is premier professional organization in Asia established in the year 1957. AFST(I) is housed in the beautiful campus of CSIR-CFTRI Mysuru Prof V Subrahmanyan, the founder President of the AFST(I), led the association during the formative period with his exemplary and visionary leadership. AFST(I), with its varied membership numbering about 5000 spread over in **48 Chapters** across the country represents scientists, technologists, professionals, academicians, industries and students in the field of Food Science and Technology. AFST(I) is continuously striving to uplift the knowledge in the area of Food Science and Technology. Membership of AFST(I) is open to all food professionals engaged in academic, industrial and related activities.

OBJECTIVES

The major objective of AFST(I) is to stimulate and advance knowledgebase on various aspects of Food Science and Technology.

MAJOR ACTIVITIES / EVENTS

- In pursuit of its objective, AFST(I) organizes National Conferences annually and International Conferences quinquennial (once in five years).
- Holding **National (ICFoST) and International (IFCoN)** Symposia and Conferences on different aspects of Food Science, Technology and Engineering. Holding Food Expositions coinciding with Symposia.
- AFST(I) publishes two prestigious journal viz., **Journal of Food Science and Technology (JFST)** a monthly online journal and **Indian Food Industry Mag (IFI Mag) -** a bimonthly journal.
- Arranging **Lectures and Seminars** for the benefit of members as a knowledge sharing platform.
- Promoting food industries development and excellence in research and development in Food Science and Technology by giving annual awards.
- To provide forum for discussion and disseminate the current developments in the field of Food Science, Technology & Engineering.
- To collaborate with other governmental and non-governmental agencies on policy matter related to food sector.

AWARDS

The AFST(I) confers various awards, fellowships and scholarships to professionals and students every year in order to recognize and honor the talent and excellence in the profession of Food Science and Technology and allied fields.

The online link to apply for membership is
https://www.afsti.org/membership
and contact AFST(I) office via
afstimys@afsti.org

OTHER ACTIVITIES / EVENTS

Apart from IFCoN & ICFoST the AFST(I) organizes a series of other activities at headquarters as well at its chapters like World Food Day, National Nutrition Day, Industry Visits, quiz contest for students.

Memorial lectures by eminent speakers are organized by AFST(I) annually in order to express sincere gratitude and to pay homage to the towering figures who led the association during its formative period through their exemplary and visionary leadership.

Webinars are being organized on burning issues related to food science and technology.

UNIQUE OPPORTUNITY FOR STUDENTS

- AFST(I) confers **Best Student Award** every year in order to recognize and encourage excellence amongst the student community in the area of Food Science/Technology/ Food Engineering/ Nutrition.
- AFST(I) Education and Publication Trust offers **Scholarships** to students studying in Food Science and Technology based on their merit cum economic background.
- Students will get **concession in registration fee** for their participation in the ICFoST/IFCoNs organized by the AFST(I), where they will get an opportunity to interact with policy makers, captains of industries, food professionals and academicians.
- Students have the opportunity to win **Best poster award**, **Best Oral presentation awards** and Travel Grant award during the ICFoST and IFCoN.
- **Logo designing completion** is organized for students during the ICFoST/IFCoN and the best logo designer will be awarded during the event.

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