

FoodPro

January-March 2023

Food Processing
Nutrition
Innovation
Value Addition
Traditional Foods
Food Machinery Shelf Life
Food Quality Nutraceuticals
Centre of Excellence
Pre & Probiotics PMFME
Skill Development
Technology Transfer
Incubation



CSIR Innovations on
Millets (IYOM)



Millet Jigyasa



ಸಿ.ಎಸ್.ಐ.ಆರ್.-ಕೇಂದ್ರೀಯ ಆಹಾರ ತಾಂತ್ರಿಕ ಸಂಶೋಧನಾಲಯ, ಮೈಸೂರು
सीएसआईआर-केन्द्रीय खाद्य प्रौद्योगिक अनुसंधान संस्थान, मैसूरु
CSIR-Central Food Technological Research Institute, Mysuru

(Council of Scientific & Industrial Research)
Mysuru - 570 020

CONTENTS

Research Highlights	2	Entrepreneurs Speak...	5
IPR in the Horizon	3	New Collaborations	5
New Technologies	3	Events	5 - 7
Technologies Transferred	4	Visitors / Selected Publications	7 - 8

Research Highlights

Impact of processing on the flavor adsorption ability of white-shrimp proteins

Proteins contribute to the flavor release and texture of foods besides their nutritional attributes. However, processing affects the protein structural conformation and, thus, their functional properties. Native proteins have structure conformational constraints for efficient functional applications, and therefore, modification of protein is essential for improved functional properties. Besides, the affinity of flavor compound to protein depends on the conformation and amino acid profile, the stereochemistry of the flavor compound, and is also influenced by temperature, pH, ionic strength, and the presence of other food ingredients. Thus, the processing conditions that lead to the changes in protein conformation, and further exposing the internal hydrophobic molecules to the surface would alter the protein-flavor adsorption affinities and production of unique flavors. Our study reveals that the thermal processing such as microwave drying, hot air drying, roasting, and boiling impacts on the structural changes and functional properties of white shrimp proteins (WSP). As flavor adsorption relies upon structural conformations, thermal processing could alter the flavor adsorption ability of WSP. Boiling exhibited the highest flavor adsorption ability among the processing methods, followed by microwave drying except for methyl butyrate. The results could provide insight into the process-induced structural transformations in WSP and can be relevant to other seafood products. This study also emphasizes the utilization scope of WSP in food industry with improved and economically viable methods specific to their techno-functional properties.

(Source : Haritha Duppeti, Sachindra Nakkarike Manjabhatta & Bettadaiah Bheemanakere Kempaiah (2023). Physicochemical, structural, functional and flavor adsorption properties of white shrimp (*Penaeus vannamei*) proteins as affected by processing methods. Food Research International, 163, 112296.)

Nutraceutical rich instant red rice bran functional food ingredient by enzymatic treatment and drum drying process

Bran from red rice is rich in nutrients and micronutrients. Enzymatic processing by treatment with fibre degrading enzyme, endoxylanase, was found to enhance the content of phyto-components with health beneficial effects. Application of drum drying process which involves cooking and drying is an ideal method to make instant/ ready-to-use food ingredient. Hence, the ingredient was studied for its impact on physicochemical, nutraceutical, storage, and product-forming properties. It was found that processing has increased the sedimentation value, water absorption capacity, retained substantially the content of nutraceuticals like phenolic acids, catechin, tocotrienols, tocopherols, total gamma-oryzanol, campesterol ferulate, etc. Furthermore, drum-drying improved the storage stability by lowering moisture, lipase activity, free fatty acids and microbial count. Finally, incorporating the processed ingredient at 10% level in food products like oats, oats porridge, flatbread(roti), rice pan cake(dosa) and groundnut snack bars exhibited excellent product forming and organoleptic properties. To conclude, the scientific and technological aspects of enzymatic treatment and drum drying process of red rice bran into ready-to-use functional food ingredient, and its quality evaluation will open up new avenues for more

value added products from industrial agro-processing by-products.



(Source: Sapna I, Jayadeep A (2023). Transformation of endoxylanase treated red rice bran into a potential ready-to-use functional food ingredient through drum drying: Impact on physicochemical, nutraceutical, storage, and product forming properties. Journal of Cereal Science, 110, 103640)

IPR in the Horizon

Patents Filed in India

- ✦ Gopinath M, Meghana N Kumar, "A process for the preparation of nanovesicles containing curcumin and piperine," App. No. 202311000890, Jan 1, 2023.
- ✦ Mohankumari Honganoor Puttananjaiah, Mohan Appasaheb Dhale, Sathish Hassan Sheshagiri, Selina Majhi, "A protein enriched product and its preparation thereof," App. No. 202311016629, Mar 3, 2023.
- ✦ Rajeshwar Shantayya Matche, Sachin Rama Chaudhari, Subhash Vishwanath Pawde, "Oxygen scavenger film from natural rubber- based material for packaging film and process for preparation thereof," App. No. 202311021355, Mar 24, 2023.

Patents Granted in India

- ✦ Lingamallu Jagan Mohan Rao, Babasaheb Bhaskarrao Borse, Maya Prakash, "Green tea nutraceutical ice cream," Pat. No. 417945, Jan 13, 2023.
- ✦ Jarpla Pura Naik, Madeneni Madhava Naidu, Halagur Gowda Sowbhagya, Hafeeza Khanum, "An improved process for the preparation of curcuminoids from turmeric (*Curcuma longa* L.) Oleoresin," Pat. No. 420032, Feb 1, 2023.
- ✦ Madeneni Madhava Naidu, Kestur Venkatesh Murthy, Hafeeza Khanum, Puspha Srinivas Murthy, "An improved process for production of turmeric powder from fresh turmeric, rhizomes.," Pat. No. 420979, Jan 8, 2023.
- ✦ Sourav Kumar, "Continuous online round grain separator," Pat. No. 427065, Mar 27, 2023.

New Technologies

Spicy Bread

Demand for functionally improved wheat based products is increasing tremendously in order to combat lifestyle disorders and reduce the risk of various chronic diseases. Spices are known for functional activity which when used in food formulations would enhance the health conditions by combating various immune related diseases spread either by various microorganisms or viruses. Adding functional ingredients from natural sources to bakery products has risen in popularity. Bread is one of the staple foods, which is widely accepted and consumed, and can impart any functional attributes. The spicy bread process consists of use of various spices (Spice mix) at optimum levels so that the organoleptic property of the brown bread is not altered much. The spice mix (Immune Boosting Ingredient - IBI) has an immunomodulatory effect in the product and does not lose its efficacy even after baking. The developed brown bread with boosting of anti-inflammatory response has whole wheat flavor along with perceptible taste and aroma of spices which leaves a lingering taste. Addition of spice mix (IBI) altered the

crumb colour to light brown with yellow tinge and is shelf stable for 7 days. The spicy bread showed high activity of immunomodulatory effect by inhibiting the responses and resisting the humoral trigger of Sheep Red Blood Cells (SRBCs). The histopathology assays showed that the bread had a similar effect as the standard anti-immunomodulatory drug. The findings imply that the developed bread has significant anti-inflammatory properties, perhaps enhancing the immunological response to inflammation.



Glucose Amla Beverage Mix

The Indian gooseberry or amla, known as *Phyllanthus Emblica* or *Emblica Officinalis*, is a super fruit with multi health benefits. The most important bioactive in amla is Vitamin C (approx. 700 mg) along with health-giving antioxidants. These antioxidants help boost immunity and fight infection. Amla strengthens absorption and assimilation of food. It improves digestion and stimulates our taste buds to relish food better. Glucose powder is necessary for all sections of the population (geriatrics to children) especially athletes, as it helps to ensure muscles have the right amount of nutrients to recover from fatigue and repair themselves during and after exertion or exercise. Glucose has high glycemic index, meaning it enters the bloodstream very quickly. Insulin

production increases immediately after taking glucose, providing a muscle-building boost as nutrients are driven into muscle fibers. Hence, a combination of these two ingredients were used to formulate this energy drink. The glucose amla beverage mix is a Vitamin C and Polyphenol-rich beverage mix which can ease chronic fatigue symptoms, and act as a nutritional ergogenic aid. It can be reconstituted using water, tender coconut water, carbonated water or with any fruit juices. It has the typical sourness and amla taste but with reduced astringency.



Technologies Transferred

- ✦ Fermented & dehydrated ready mix for dosa batter (Vasavi Foods, Telangana)
- ✦ Nutra chikki with added spirulina (Mrs. Padmavathi V, Koppal; M For Millet Foods Pvt. Ltd. Telangana; Sri Vigneshwara Damanitha Womens SHG, Bellary)
- ✦ Roasted and flavoured cashew kernels (SVC Foods, Mandya)
- ✦ Preparation of shelf stable roti from non-wheat cereal and millet (FiveKosha Elements Pvt. Ltd. Bengaluru)
- ✦ Roller milling process for semolina (sooji/rava) from millets and preparation of multimillets semolina, Instant halva mix from millets and multimillets semolina, Instant Upma mix from millets and multimillets semolina, Instant Rava idli mix from millets and multimillets semolina (Salem Food Products Pvt. Ltd. Salem; Panchamrutha Industries Pvt. Ltd., Dharwad)
- ✦ Preparation of ready to eat shelf stable egg crunchy bite (Mrs. Renu Priya Natarajan, Tamilnadu)
- ✦ RTS fruit juices and beverages (Planters Treasure Enterprises Pvt. Ltd., Cochin)
- ✦ High performance advanced oxidation process for STP's grey water and industrial waste water (Food and Non Food) (Global Technologies, Bengaluru)
- ✦ Preparation of shelf-stable egg albumin and egg yolk cubes (Mrs. Sapna Mewara, Rourkela)
- ✦ Instant products from moringa leaves (Mrs. Katyayini D Singh, Bengaluru)
- ✦ Production of soya protein hydrolysate (Shrihari Nutrition Pvt. Ltd., Maharashtra)
- ✦ Convenience flour from ragi suitable for stiff porridge (Ram Gold Organics, Ramanagara)
- ✦ Eggless cake premix, Baking powder, Instant cake mix (Sensarom Foods Pvt. Ltd., Bengaluru)
- ✦ Process for nutri fruit bars with immune boosters (Viaduct Traders Pvt. Ltd., Kerala)
- ✦ Shelf-stable varieties of curry pastes for vegetarian & non-vegetarian traditional cuisines, Instant gravy mixes (dehydrated) (Coastal Voluntary Network, Andhra Pradesh)
- ✦ Herbal fogging disinfectants for mist sanitizer system (Hardik Herbals, Dakshina Kannada)
- ✦ Preparation of RTE shelf stable egg crunchy bite (Sanupriya Farmers Producer Company Ltd., Maharashtra)
- ✦ Fermented and dehydrated ready mixes for idli / dosa batter (Ponnampilly Traders and Manufactures, Kerala)
- ✦ Dipping oil formulation for grapes (Ceres Organics Pvt. Ltd., Mumbai)
- ✦ Ginger paste, Garlic paste (Mahashian Di Hatti Pvt. Ltd., Haryana)
- ✦ Instant traditional food: Sambar (Kalparuchi Foods Pvt. Ltd., Bengaluru)
- ✦ Preparation of dehydrated egg cubes, Meat / Fish / Chicken / Egg / Pork / Prawn Wafers (Palindrome Enterprises, Mysuru)

Entrepreneur's Speak

Aquaseal Technologies and Infra Projects Solutions in Mysuru, Karnataka, have over 25 years of experience in the cultivation of Spirulina and its processing into spray dried algal powder, as well as the production of CSIR-CFTRI licenced Nutra Spirulina enhanced Sweet Peanut Chikki. We also supply spirulina in capsule and tablet forms.

Since 1993, we have been producing Spray Dried Spirulina alga powder and are grateful to CSIR-CFTRI for offering a golden opportunity to obtain technology to supply Innovative and Healthy Nutra Spirulina chikki.

Spirulina is a superfood that may be ingested in the form of food, tablets, and capsules, and we asked CSIR-CFTRI to develop a food product with spirulina in an eatable form. During the country's lockdown in March 2020, we had the opportunity to supply 3MT of spirulina chikki to the country's needy citizens. Even when the country is under strict lockdown, we could obtain raw materials such as high-quality peanuts, jaggery, spirulina, packing material, and labour. We would like to thank the Director, CSIR-CFTRI, and the Scientists for giving us opportunities to share our experiences and challenges on different platforms.

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New Collaborations

✦ Central Ayurveda Research Institute (CARI), Bengaluru (Jan 19, 2023)

CSIR-CFTRI has initiated a collaborative research projects with CARI, Bengaluru, pertaining to understanding of nutrition in diabetes and the evaluation of dietary articles for their compositions and efficacies with a focus on diabetes.



✦ Spices Board, Cochin (Mar 3, 2023)

CSIR-CFTRI and Spices Board, Cochin signed an MoU to work in mutually agreed-upon aspects for establishing a 'Incubation Centre for Spices' at the CSIR-CFTRI campus, within the facility created with the support of the Nutra-Phyto Incubation Centre & Common Instrumentation Facility (NPIC-CIF), Mysuru. This Agreement aims to support and mentor eligible startups/ exporters/ entrepreneurs/ FPOs in the areas of innovation/ creation of novel processes/ technologies/ goods using spices and allied fields, with the goal of promoting novel solutions and products.



Events

New Year Address (Jan 2, 2023)

Dr. Sridevi Annapurna Singh, Director of CSIR-CFTRI, addressed the Institute's staff and students on the occasion of the New Year 2023. On this occasion, the CSIR-CFTRI calendar 2023 with the theme "Millets" was also released.



Nutrition Intervention (Jan 10, 2023)

Nutrition Intervention Program was launched by Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI on 10th January, 2023 at an Anganwadi of Kalale village, Nanjanagudu taluk, Mysore district. The training programme is for a duration of 6 months with 250 nos. of malnourished children of Nanjanagudu taluk participating in it. This programme is being conducted in association with Department of Women and Child development, Govt. of Karnataka and funded by the Jubilant Bhartia Foundation.



Hands-on Training and Workshop (Jan 16-20, 2023)

Hands-on Training and Workshop on “High End Mass Spectrometry Based Lipidomics for Food and Biomedical Sciences” was held during Jan 16-20, 2023 under the aegis of SERB, DST which was organised by CSIR-CFTRI. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI, was the Chief Guest and Dr. Lalitha R. Gowda, Retd. Chief Scientist, CSIR-CFTRI, was the Guest of Honour. Prof. em. Jerzy Adamski, Technical University of Munich, Germany, delivered the keynote address in online mode.



Diabetes Screening Camp (Jan 19, 2023)

“Diabetes Screening Camp” and “General Health Check-up” was organised on 19th January, 2023 at CSIR-CFTRI campus. The free camp was held by Ayurvedic Doctors from Central Ayurveda Research Institute, Ministry of Ayush, Bengaluru, for the benefit of employees and their family, retirees and students.

Republic Day Celebrations (Jan 26, 2023)

As part of Republic Day Celebrations, Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI hoisted the National Tricolour Flag and delivered the Republic Day address on Jan 26, 2023.



International Year of Millets (IYOM) 2023 (Jan 30, 2023)

As part of International Year of Millets (IYOM) 2023 celebrations, Council of Scientific and Industrial Research (CSIR), New Delhi & Central Food Technological Research Institute (CSIR-CFTRI), Mysuru organised the event “CSIR innovations on Millets” on 30th January, 2023 at CSIR- National Physical Laboratory (NPL) Auditorium, New Delhi. Interaction with experts' scientists, industrial partners and release of Millet Calendar highlighting CSIR Innovations on Millets Technologies were the key activities of the event. Dr Jitendra Singh, Hon'ble Union Minister of State (Independent Charge) Science & Technology; Minister of State (Independent Charge) Earth Sciences; MoS PMO, Personnel, Public Grievances, Pensions, Atomic Energy and Space and Vice-President, CSIR was the Chief Guest for the function. Dr. Jitendra Singh, Hon'ble Minister inaugurated the exhibition and also the display of products and technologies developed by CSIR-CFTRI and other CSIR labs. The Hon'ble Minister released the Desktop Calendar 2023 on “CSIR Innovations on Millets” and delivered the Chief Guest's address. A video presentation prepared on this occasion about millets and their health benefits and technologies and products brought out by CSIR, CFTRI in particular was made. Dr. Venugopal Achanta, Director, CSIR-NPL, New Delhi welcomed the gathering. Dr Sridevi Annapurna Singh, Director, CSIR-CFTRI, Mysuru spoke about the theme of the event “CSIR innovations on Millets” being celebrated as part of International Year of Millets, 2023 and also the key contributions of CSIR in the area of millet processing.

National Science Day (Feb 28, 2023)

National Science Day Lecture was held on 28th February,

2023 at CSIR-CFTRI campus. Prof. M.R.N. Murthy, Emeritus Professor, Indian Institute of Science (IISc) was the Chief Guest and delivered the National Science Day lecture on "Excursions in the Wonderland of Proteins" and also interacted with school children. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided over the event.



Millet Jigyasa (Feb 28, 2023)

On the occasion of National Science Day on February 28, 2023, Jigyasa programme on millets was held at the CSIR-CFTRI campus. The Chief Guest was Sri Ramachandra Raje Urs, Deputy Director of Public Instruction, Mysuru, Govt. of Karnataka, and the Guest of Honor was Prof. H.S. Nagaraja Prayoga, IER, who addressed the gathering. The occasion was presided over by Dr. Sridevi Annapurna Singh, Director of CSIR-CFTRI. Approximately 200 students took part in the programme.

Siridhanyada Siri Radio Programme (Mar 4, 2023)

"CSIR-CFTRI Siridhanyada Siri", a millet-based information series in Kannada language, produced by CSIR-CFTRI is being broadcast from All India radio, Mysuru from 4th March, 2023 to 15th July 2023 on the occasion of 'International Year of Millets 2023'. The following talks have been aired in the month of March 2023.

- ✦ About International Year of Millets 2023 by Sri B. V. Sathyendra Rao
- ✦ About Millets-Ragi by Dr. Usha Dharmaraj
- ✦ About Millet Agriculture by Dr. R.V. Sreedhar

International Women's Day (Mar 8, 2023)

International Women's Day was celebrated on 8th March, 2023. On this occasion, Smt. Nagamma, a small and marginal farmer involved in the conservation of historic varieties, was honoured. Prof. Bina Joe, University of Toledo College of Medicine and Life Sciences, USA, was the Chief Guest and delivered an online Women's Day lecture titled "Celebrating the Pursuit of Happiness through Womanhood." Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI, presided over the occasion and delivered the International Women's Day address.



Training Program on Web of Science (Mar 28, 2023)

Training Program (Presentation & Demo) on Web of Science & End Note was held on 28th March, 2023. Mr. Vishav Sharma, Clarivate Analytics, India conducted the training programme. 85 students took part in this programme.

Visitors

- ✦ International Delegates from Developing countries (from Africa and Asia) who are participants of ni-MSME, Hyderabad training programme visited CSIR-CFTRI on 17th January, 2023.
- ✦ Mr. Al Harthy Mohammed Sulaiman Hamad, CEO, Nitaj, Oman Food Investment Holding Company, Sultanate of Oman visited CSIR-CFTRI on 18th January, 2023 and interacted with the Director, CSIR-CFTRI and scientists and also visited ISMT mill.



- ✦ Two batches of IAS Trainee Officers visited the Institute and its facilities on 23rd Jan, 2023(I Batch) and on 27th Jan, 2023(II Batch) as part of Bharath Darshan and interacted with the Director, CSIR-CFTRI and scientific staff.

- ✦ Hon'ble Cabinet Minister for Agriculture, Uttar Pradesh Shri. Surya Pratap Shahi along with his Ministerial colleagues, Govt. of Uttar Pradesh visited CSIR- CFTRI on 20th January, 2023. Shri. Dinesh Pratap Singh, Minister of State (Independent Charge) for Horticulture, and Shri Baldev Singh Aulakh, Minister of State for Agriculture, Govt. of UP also accompanied him during the visit along with Shri Manoj Kumar Singh, Additional Chief Secretary, Govt. of UP, Shri Anjani Kumar Singh, IAS along with other Officials of Department of Agriculture both from UP and Karnataka. During this occasion an interaction meeting with the Director, CSIR-CFTRI and Scientific staff was held wherein Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presented the contribution of CSIR-CFTRI and its role in Agro-Food processing. The delegation also visited CSIR-CFTRI facilities such as CFTRI Show Case, Food Engineering Pilot plant, Automated roller flour mill and Food Safety and Analytical Quality Control Laboratory.



- ✦ A French Delegation from the Embassy of France led by Mr.Thierry Berthelot, Consul General of France in Bengaluru, India; Dr. Francois-Xavier Mortreuil, Attache for Science and Academic Cooperation, Embassy of France - French Institute India, Consulate General of France in Bengaluru, visited the Institute on 9th March, 2023 and interacted with scientists about Indo-French cooperation strategies for research and science translation.

Technical and Invited Talks

- ✦ Dr. Shantanu Sengupta, Chief Scientist, CSIR-IGIB, Delhi & Project Leader "Phenome India" delivered the Technical seminar entitled "Phenome India: CSIR Health Cohort Knowledge Base" on 17th January, 2023 at CSIR-CFTRI.

- ✦ Prof. Desirazu N. Rao, Hon. Professor, Dept. of Biochemistry, Indian Institute of Science, Bangalore delivered invited talk entitled "*Helicobacter pylori* and Humans: An ancient association" on 17th February, 2023 at CSIR-CFTRI which was organised by Association of Microbiologists of India(AMI)-Mysore Chapter in association with CSIR-CFTRI.

Awards

- ✦ CSIR-CFTRI received the "Best Institute for Innovative Research and Development on Millets" award in Millets & Organics 2023 International Trade Fair (MOITF2023) held at Bengaluru during January 20-22, 2023.
- ✦ Mrs. B. Rohini, Research scholar from Food Engineering Department of CSIR-CFTRI received 'Augmenting

Writing Skills for Articulating Research (AWSAR)' award for her research writing entitled "Nature's Imitation: A Pollution-free Solution for the Ignition". She received 3rd prize under Ph.D. category and received this award from Dr. Jitendra Singh, Hon'ble Union Minister of State (Independent Charge) Science & Technology and Vice-President, CSIR, at the event of National Science Day celebrations held on 28th February 2023 at Vigyan Bhavan, New Delhi.

Selected Publications

- ✦ Haritha Duppeti, Sachindra N.M., Bettadaiah B.K., Physicochemical, structural, functional and flavor adsorption properties of white shrimp (*Penaeus vannamei*) proteins as affected by processing methods, *Food Res. Int.*, 2023, 163, art. no. 112296. (IF: 7.425)
- ✦ Moumita Das, Suresh Kumar G., Ergosterol fraction from *Agaricus bisporus* modulates adipogenesis and skeletal glucose uptake in high fat diet induced obese C57BL/6 mice, *Life Sci.*, 2023, 315, art. no. 121337. (IF: 6.78)

- ✦ Sowmya Shree G., Shinde Vijay S., Baskaran V., Ganesan P., Lutein ameliorates high-fat diet-induced obesity, fatty liver, and glucose intolerance in C57BL/6J mice, *Phytother Res.*, 2023, 37 (1), pp. 329-341. (IF: 6.388)
- ✦ Sowmya Giriapura V., Kalpana Patel, Ravi Mangu S., Govindraj Ellur, Shinde Vijay S., Kunal Sharan, Maternal omega-3 LC-PUFA supplementation programs an improved bone mass in the offspring with a more pronounced effect in females than males at adulthood, *J. Nutr. Biochem.*, 2023, 113, art. no. 109245. (IF: 6.117)

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DIRECTOR
CSIR-CFTRI, Mysuru
director@cftri.res.in

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