

# FoodPro

CSIR-CFTRI Newsletter

January-March 2024



— Giving Food a Future —

**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**



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CSIR - Central Food Technological Research Institute, Mysuru



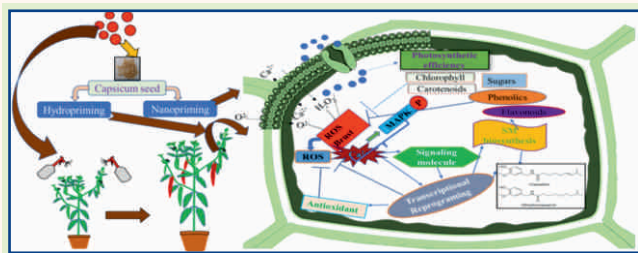
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## Research Highlights

### Chitosan-based nanoparticles can enhance the health and yield of Capsicum spp plants.

The study examined the impact of Chitosan-based nanoparticles on plant health, focusing on physiological traits, biochemical composition, and protection against



thrips pests. The researchers analysed the particle size, polydispersity index, composition, and structure of the synthesised Chitosan-based nanoparticles. Techniques including zeta potential analysis, FTIR, TEM, and XRD were employed to unravel the mysteries of these tiny agents. Seed priming with Chitosan nanoparticles at concentrations up to 50 ppm resulted in significant improvements in seedlings' physiological and biochemical traits. Applying nanoparticles of varying concentrations (20 to 100 ppm) to *Capsicum annuum* (three varieties tested) plants improved physiological traits and provided strong protection against thrips infestation, with efficacy ranging from 70% to 85%. Improvement recorded in physiological parameters highlights the potential of nanoparticle-based technologies to enhance crop productivity and quality, offering promising prospects for sustainable agriculture. Research has shown that using Chitosan-based nanoparticles can significantly increase essential compounds found in Capsicum plants. There were noticeable improvements in the levels of chlorophyll (20–75%), carotenoids (20–30%), total phenolics (20–45%), total flavonoids (40–125%), reducing sugars (15–40%), total antioxidant activity (10–82%), FRAP (Ferric Reducing Antioxidant Power) (10–100%), DPPH

(2,2-diphenyl-1-picrylhydrazyl) activity (76–83 mg mL<sup>-1</sup>), and total capsaicinoids (125–142%). When treated with chitosan nanoparticles, there was a 27% increase in yield. The study highlights using Chitosan-based nanoparticles to enhance secondary metabolite production, increase disease resistance, and promote growth in Capsicum spp. plants, thereby promoting sustainable agriculture. In this regard, large-scale field performance studies are needed. This work offers a viable solution for looming issues in agriculture: using nanotechnology to improve food security, productivity, and environmental impact.

(Mawale K.S., & Giridhar P. (2023). Chitosan nanoparticles modulate plant growth, and yield, as well as thrips infestation in Capsicum spp. *International Journal of Biological Macromolecules*, 254, 127682.)

### Insecticidal property of Ocimum essential oil embedded polylactic acid packaging films for control of insect pests

*Sitophilus oryzae* and *Callosobruchus chinensis* represent major insect pests of stored grains, contributing to post-harvest losses not only in India but globally as well. To effectively mitigate these losses, there is an urgent need to devise an insect-proof packaging system. In this study polylactic acid (PLA) biopolymer was used due to its biodegradable property and excellent tensile strength as a packaging material for development of eco-friendly insecticidal bags. *Ocimum* plant species are well documented for its insecticidal properties as it contains bioactive components. Essential oils (EO) derived from *Ocimum* plants can be potential alternatives for presently used chemical and synthetic pesticides hence in this study essential oils from *Ocimum basilicum* (OB) and *Ocimum gratissimum* (OG) were incorporated in PLA matrix. Chemical constituents of EO were determined by GC-MS analysis revealed presence of estragole (OB) and thymol (OG) as major compounds. Examination of insecticidal, physical, and mechanical properties of developed films in



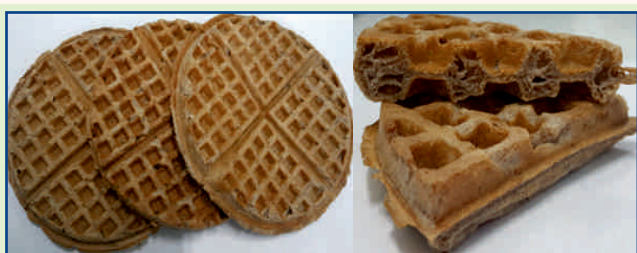
comparison with commercially available films disclosed, that the insecticidal efficacy was found to be equivalent to the commercial hermetic bags (CSB). As the developed films with EOs showed notable insecticidal activity with complete mortality (100%) and 80 % for OB and OG, respectively against *Sitophilus oryzae*. However, both OB and OG EOs displayed 100% mortality against pulse beetle (*Callosobruchus chinensis*). The physical property of film showed increase in the film thickness in EO-PLA films whereas mechanical properties revealed increase in the polymer flexibility. The FTIR spectra and SEM analysis of the PLA-EO film, revealed a thorough homogenization of

the essential oil within the PLA matrix. This study emphasizes the utilization of naturally derived biorational molecules to safeguard grains against insect infestation. It proposes a biodegradable packaging system infused with these biologically active molecules, presenting a novel approach to combat post-harvest losses on a global scale. (Source: Prabhakar P. R., Reddy J. P., Murthy P. K., & Vivek Babu C. S. (2024). Insecticidal property of *Ocimum essential oil embedded polylactic acid packaging films for control of Sitophilus oryzae and Callosobruchus chinensis*. *International Journal of Biological Macromolecules*, 256, 128298).

## New Technologies

### Multigrain Waffle

The popularity of bread variants such as waffles is increasing. Waffles are wheat based baked product which can be taken as a bread variant for breakfast, snack or as desserts with variety of toppings. It is popular among children, adolescents and young adults. Generally, waffles are made from refined wheat flour with high contents of sugar and fat. They often have high calorie with low dietary fiber and essential minerals. In order to improve the nutritional quality, the multigrain waffle has been formulated using whole wheat, pearl millet and finger millet flours with optimal amount of sugar and fat. The multigrain waffle has higher dietary fiber (7.5-8%), minerals (Fe: 3-4, Zn:1.2-1.5, Ca: 95-100, Mg: 50-52, K: 180-185 mg/100g) and lower calorie value as compared to the commonly available waffles in the market. The sensory studies revealed desirable attributes for the product. Waffles will cater the growing consumer demand for healthy and convenient foods. It can be marketed as a quick snack or desserts through bakeries, departmental stores and restaurants.



### Ready to Use Multi-Grain Idli and Dosa Batter in Retail Packs

The ready-to-cook market in India is estimated to grow as the number of working population increase. Convenience food items are becoming more and more popular because they are easy to make, packed with nutrients, and beneficial to health. However, the rising number of lifestyle diseases is predicted to drive the demand for nutritious convenience foods. Traditional foods like *Idli* and *Dosa* require time, effort, and skill for their preparation. Consumers are looking for time-saving solutions to make quick, nutritious, tasty breakfast items. Nowadays, *Idli* and *Dosa* are prepared from packaged, branded ready-to-cook batter. The multigrain batter ingredients in the product are carefully selected and blended to provide the ideal combination of taste, texture, and nutrition for making both *Idli* and *Dosa*. The blend of grains in this batter has higher protein and minerals compared to the normal *Idli* and *Dosa* batter. The raw materials include rice, blackgram, and blend of multi-grains.



## Technologies Transferred

- ✦ Fermented and dehydrated ready mixes for *Idli/Dosa* batter (Sarathi Enterprises, Pune)
- ✦ Ready mix: *Upma, Vada*; Fruit syrups and squashes; Fermented and dehydrated ready mixes for *Idli/Dosa* batter (Mahashian Di Hatti Private Limited, Haryana)
- ✦ Fruit syrups and squashes (Smart Packaging, Chennai)
- ✦ High Performance Advanced Oxidation process for STP's grey water and industrial waste water (Food and Non Food) (Mak India Ltd., Coimbatore)
- ✦ Process for production of millet and multimillet

- semolina; Millet and multimillet instant upma mix; Millet and multimillet instant rava idli mix; Millet and multimillet instant halwa mix; Instant finger millet rava idli mix; Instant finger millet halwa mix; Instant finger millet khichidi mix; Instant finger millet upma mix; Finger millet semolina; Millet and multimillet puttu podu mix (Pitambari Products Pvt.Ltd., Navi Mumbai; Naga Limited Consumer Division-Research & Development Centre, Dindigul; Mothers Agro Foods Pvt.Ltd, Kerala)
- ✦ Pickles and chutneys preparation (Adi Lakshmi Global



- Solutions, Shivamogga)
- ⤴ Process for nutri fruit bars with immune boosters; Roasted and flavoured cashew kernels (Transcend Food Works Pvt.Ltd, Vijayawada)
  - ⤴ Instant Coffee cubes (DDR Ventures LLP, Bangalore)
  - ⤴ Tamarind juice concentrate; Tamarind Juice concentrate & Powder; Tamarind Candy (District Rural Development Agency (DRDA), Chittoor)

- ⤴ Online fortification of Atta (Whole wheat flour)/ Maida (Refined wheat flour) (Panchamrutha Industries Pvt. Ltd., Dharwad)
- ⤴ Ready to use multigrain Idli and Dosa batter in retail packs (Mr. Rajkumar Y V, Tamilnadu)
- ⤴ Coffee Concentrate (Aaraku Origin coffee, Chikkamagaluru)
- ⤴ Green pepper in brine (Mrs. Aruna AK, Areenoor)

## IPR in the Horizon

Aptamer for Detection of SARS-Cov-2 Virus. Praveena Bhatt Mudliar, Pravin Savata Gade, Abhigna Nagaraj, Dinesh Kumar Saini, Manjunath S Devaramani, Sarma

Mutturi, Mukesh Kapoor. 12-Mar-24, 0021NF2024, 202411017997.

## Short Term Training Programmes Scheduled (Jan - Mar 2024)

- ⤴ Applications of Sophisticated Analytical Instruments (FT-IR, GC-MS, HRMS, IR-MS & NMR) in the Analysis of biomolecules in the food (08.01.2024-12.01.2024)
- ⤴ Post-Harvest Technologies for Value Addition to Sweet Lime, Custard Apple, Onion and Chilli (22.01.2024-23.01.2024)
- ⤴ Application of Instrumental Analysis in Additives and toxins (FSSAI -5) (22.01.2024-24.01.2024)
- ⤴ Chromatographic Techniques (GC, HPLC, UHPLC) and their analytical approaches in Food Analysis (05.02.2024-09.02.2024)
- ⤴ Extraction and Quality Assurance of Edible Fats and Oils (19.02.2024-21.02.2024)
- ⤴ Pesticides Analysis in various Food Matrices (FSSAI-6) (21.02.2024-23.02.2024)

- ⤴ Processing of Tamarind and Value Addition (19.02.2024-20.02.2024, 22.02.2024-23.02.2024, 26.02.2024-27.02.2024, 04.03.2024-05.03.2024, 11.03.2024-12.03.2024)
- ⤴ Rice Milling and Value Addition to Rice under Indian Technical and Economical Programme (ITEC) sponsored by Ministry of External Affairs (MEA), Government of India (27.02.2024-18.03.2024)
- ⤴ Processing of Paddy and Pulses for Value Addition (26.02.2024-28.02.2024)
- ⤴ Processing of Millets for Value Added Products (26.03.2024-28.03.2024)
- ⤴ Value Added Products for Minor Millets (sponsored by KVIC, Mumbai) Conducted at RC Hyderabad (25.03.2024-28.03.2024)

## Entrepreneurs' Speak

**We, The Jainum Food and Waste Projects Pvt Ltd., Dewas (M.P.)** are a manufacturer of Food Processing Equipment and recently ventured into production of roasted / dried food products like Suji (Rava), Dalia, etc. We have acquired the technology from CSIR- CFTRI for producing instant recipe from millets to enhance our product line.

**Product ranges & brand :** We are supplying roasted products like Suji (Rava), Dalia, dried flours of Wheat, Millets, Gram, Corn etc. and dried Pulses. Also, products like Chakki Atta, Maida, Besan, Jowar and Bajra flour are included in our product range.

**Vision & challenges :** To introduce many Millet based

flours, grits and instant mixes. Present challenges are project execution at a reasonable cost and at a timely manner.

**Role of CFTRI in catalyzing growth of your firm :** As product quality plays a key role in its success, we bank upon CSIR-CFTRI to assist us in producing the right quality product acceptable in the market.

**Your advice to emerging startups:** Focus and determination towards the success of your product is must. Gestation period of the project should be kept as low as possible.



**WeMill** is a rural social business that has contributed significantly towards sustainable livelihood of 14 first-generation women entrepreneurs from Bilikere village of Mysuru district. GRAAM conceptualized 'We Mill' in 2019 with corporate partner Wurth Elektronik. CSIR-CFTRI provided a technology and capacity development support with an aim to develop a 'rural wealth creation model'. The team has been working on development of Ragi based products, capacity building, marketing and developing overall entrepreneurial mind-set of the women.

**About GRAAM :**

Grassroots Research and Advocacy Movement (GRAAM) is a policy research think tank working across 18 states of India, based in Karnataka. With expertise in policy research, program evaluation, community consultation, policy engagement, strategic consultation, and academic programs, GRAAM strives to provide a pragmatic models based on the philosophy of human and social capital development.

WeMill woman carefully source ragi from the local farmers and prepare this box of health with utmost love and care. Products are made by the devote mothers with "Health First, Business Next" Motto.

"While one is impacting the health and well-being of their loved ones, they are also contributing to the vision of building a self-sufficient and self-reliant India through this project, thus contributing our bit towards making India a 5 trillion-dollar economy", says Dr. Basavaraju R Shreshta, the Executive Director of GRAAM who also conceptualized the project.

**Product ranges & brand**

Premium Ragi, Premium Ragi Flour, Ragi Malt n Shake, Ragi Mudde Mix, Shishuposhan I, Shishuposhan II, Ragi Huri Hittu, Ragi Dry Fruit Cookies, Ragi Jaggery Cookies, Ragi Chocolate Cookies, Ragi Spicy Cookies, Ragi Coconut Cookies

**We Mill Impact**

The women who are actively engaged are getting

sustainable livelihood opportunity with pride. They are not merely employees but they are the proud owners and entrepreneurs. By sourcing ragi from local farmers, they are also providing a guaranteed market at the village level. It is also creating circular economy. Now, WeMill initiative is a demonstration plot for many Self Help Group and Farmers Groups.

**Vision & challenges**

Following ideals of Gram Swaraj and Atmanirbhar Bharat, our aim is to increase rural wealth. Through the hub and scope model, our aim is to make livelihood cluster creating at least 100 more women entrepreneurs from the surrounding villages of Unit. Lack of facilitative policy and administrative support for rural women social business, high promotional and marketing expenditures, lack of promotional and sales platforms by Government are some of the challenges.

**Role of CFTRI in catalysing growth of your firm**

The WeMill woman entrepreneurs have been trained and mentored by scientists of CSIR-CFTRI, the country's premier food technology institute. CFTRI's Technologies have been adopted in most of our products. CSIR-CFTRI is also providing marketing promotion opportunity in CSIR-CFTRI events and introducing WeMill to B2B ventures.

**Your advice to emerging startups**

Identify the local agricultural produces and inherent artisan skills if you are planning to start your initiatives in the rural areas. Identify and understand competitive advantages. Products requires to be unique, if not, it should be uniquely promoted. Social Media platform should be completely leveraged for promotion



**New Collaborations**

- ✦ **UPL Limited, Mumbai (Jan 30, 2024)**  
Collaborate to initiate R&D projects on grain storage management, grain protection and infestation control.
- ✦ **Milltec Machinery Pvt Ltd., Bengaluru (March 1, 2024)**  
To support in the establishment of selected secondary millet processing lines suitable for farmers, FPOs, SHGs and other allied sectors as a CSR initiative

- ✦ **BAIF Development Research Foundation, Pune (March 5, 2024)**  
Work together to conduct trainings for small-scale food processing initiatives and develop relevant extension aids for the benefit of rural communities.





## Events

### **New Year Address (Jan 1, 2024)**

Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI addressed all staff and students of the Institute on 1<sup>st</sup> January 2024 and highlighted the achievements of CSIR-CFTRI in the past year and presented road map for the new year.



### **Research Council Meeting (Jan 25, 2024)**

6<sup>th</sup> meeting of 11<sup>th</sup> Research Council was held on 25<sup>th</sup> January 2024. The Chairperson and members of the RC also visited CFTRI licensees, We Mill™, Asare Sanjevini Food Products, Bilikere and M/s Shri Shridhareshwara Coconut Products (Abhay), Hebbal, Mysuru.



### **Republic Day (Jan 26, 2024)**

As part of 75<sup>th</sup> Republic Day celebrations, Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI hoisted the National Flag and delivered Republic Day address. As part of the celebrations, Rangoli competition and T-6 Cricket Tournament were held on 18<sup>th</sup> January and 23<sup>rd</sup> January 2024, respectively and also Photography competition was held 18<sup>th</sup> January 2024. Director distributed cash prizes, medals and certificates to winners of the above competitions.



### **Akashvani Series**

CSIR-CFTRI and All India Radio (Akashvani) Mysuru have jointly produced a forty-episode series on "Innovations and

researches of CSIR-CFTRI" in Kannada, titled as "CFTRI – Shodha – Anushodha". Each topic has had one weekly airing of the following talks from January-February 2024.

- ✦ Dr. B. K. Bettadaiah-What are Spice Oleoresins?
- ✦ Shri. M.N. Keshava Prakash-Instruments used in Food Research
- ✦ Dr. R. Chethana-Balanced Diet
- ✦ Dr. R. Baby Latha-Innovations of Instant mixes
- ✦ Mrs. C. Soumya-Healthy Bakery Products
- ✦ Dr. Pushpa S Murthy-Cola77: What is it?
- ✦ Shri K. Sheshanarayana-Roasting methods of oilseeds and grains
- ✦ Shri Girish Ghiwari-Cooking methods: Infrared cooking

### **Phenome India-CSIR Health Cohort Knowledge-base (Feb 22-27, 2024)**

Comprehensive Health Checkup screening Camp under Phenome India-CSIR Health Cohort Knowledgebase (PI-CHeCK) was held during February 22-27, 2024 at CFTRI campus for staff and retirees. This camp was inaugurated by Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI on 22<sup>nd</sup> February 2024. Nearly 310 persons were screened during the camp.



### **Training programme on "Rice Milling and Value Addition to Rice" (Feb 27-March 18, 2024)**

CSIR-CFTRI organized the training programme on "Rice Milling and Value Addition to Rice" for Guyanese delegation under Indian Technical and Economic Co-operation (ITEC) Programme sponsored by Ministry of External Affairs (MEA), Government of India during 27<sup>th</sup> February to 18<sup>th</sup> March 2024. 29 delegates from Guyana attended this training programme. Apart from Guyana Rice Development Board (GRDB), this course had representations from Guyana School of Agriculture, University of Guyana, Institute of Applied Science & Technology, Guyana Food Safety Authority, Guyana Marketing Cooperation, Banks DIH Ltd., Ministry of Home Affairs, Ministry of Local Government & Regional Development, Ministry of Agriculture and its allied Departments/Institutes etc. The 3 week training programme was inaugurated by Dr. S. Zakiuddin Ali, Chief Scientist (Retd) & Former Head, Grain Science & Technology, CSIR-CFTRI on 27<sup>th</sup> February 2024. Dr. Rama Swami Bansal, Chief Scientist & Head, ISTAD, CSIR, New Delhi was the Guest of Honour and Dr.Sridevi Annapurna Singh, Director, CSIR-CFTRI presided over the

function. The valedictory session was organized on March 18, 2024. Dr. S Ayyappan, Chairman, Research Council, CSIR-CFTRI, Former Secretary, Dept of Agricultural Research & Education Former Director General, ICAR was the Chief Guest and Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided over the function and Dr. Rama Swami Bansal, Chief Scientist & Head ISTAD, CSIR, New Delhi was the Guest of Honour. The Chief Guest of the function, Dr. Ayyappan handed over the participation certificates to the delegates and also released the monograph on “Contributions of CSIR-CFTRI Towards Rice Research” during this event.



### National Science Day (March 1, 2024)

National Science Day-2024 programme with the theme “Indigenous Technologies for Viksit Bharat” was held on 1<sup>st</sup> March 2024 at CSIR-CFTRI campus. Prof. S.R. Niranjana, Vice-chairman, Karnataka State Higher Education Council and former Vice-chancellor of Gulbarga University was the Chief Guest and delivered the National Science Day lecture on "Development of Science and

Technology in India”. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided over the event.



### International Women's Day (March 8, 2024)

International Women's Day 2024” Indian Women-Excellence in Science” was celebrated on 8<sup>th</sup> March 2024. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided over the event and delivered International Women's day message. Various women scientists from CSIR-CFTRI & Guyanese delegates participated in the event and shared their experiences.



## Visitors

▲ Hon'ble Cabinet Minister for Agriculture, Uttar Pradesh Shri. Surya Pratap Shahi along with his team, Govt. of Uttar Pradesh visited CSIR-CFTRI on 6<sup>th</sup> January 2024 and its facilities, Millets showcase and interacted with scientific staff. The Hon'ble Minister and team also visited CSIR-CFTRI licensees M/s Poustik Agro Food Products at Hebbal, Mysuru and We Mill™, Asare Sanjevini Food Products, Bilikere facilities on Millets & interacted with them.



▲ Japanese delegation consisting of Dr. Siddabasave Gowda and Prof Teruo Sone, Dean of Graduate School of Global Food Resources, Prof. Katsuhiko Ogasawara, Prof., Faculty of Health Sciences from Hokkaido University, Japan visited CSIR-CFTRI and its facilities on 19<sup>th</sup> January 2024 and interacted with scientists for further collaborative research.



▲ Prof. R. Ramaswamy, Sr. Associate Dean, School of Chemical, Materials & Biomedical Engineering, University of Georgia, USA, visited CSIR-CFTRI and its facilities on 23<sup>rd</sup> January 2024 and interacted with Director and scientists to explore collaborative opportunities in the area of Food Safety & HRD activities.





- Poland delegation consisting of Prof. Piotr Szulc, Poznan University of Life Sciences, Department of Agriculture; Przemysław Lecyk - Agricultural Advisory Center in Brwinów Branch in Poznań; Prof. Joanna Kobus-Cisowska; Maria Zdebska and Barbara Majoch from Industry visited CSIR-CFTRI and its facilities on 29<sup>th</sup> January 2024 and interacted with Director and scientists to discuss about collaborative research on post-harvest technologies and value added products from ginger.



- Prof. M. Pushpavathi, Director, All India Institute of Speech and Hearing (AIISH), Mysore and her team visited CSIR-CFTRI and its facilities on 2<sup>nd</sup> February 2024 and interacted with Director and scientists to discuss about collaborative research in the area of Food processing and Nutrition.



- ASC Senior Officers who are participants of Training Programme Adv. Sup. Mgt. & Food Tech Course (ASMAFT-18) from ASC Centre & college, Bangalore visited CSIR-CFTRI and its facilities on 20<sup>th</sup> February 2024.
- Oman delegation consisting of Prof. Ali Al Bimani, Vice-Chancellor, National University of Science and Technology (NUST), Sultanate of Oman and his team along with Prof. Mubarak Pasha, The First Vice Chancellor Sreenarayanaguru Open University, Kollam (The State University of Kerala) visited CSIR-CFTRI and its facilities on 28<sup>th</sup> February 2024 and interacted with Director and scientists to discuss about collaborative research and HRD activities in Food Technology.

## Technical Seminar

Technical Seminar on “Grain Processing Machinery and Value Addition to Millets” was organized at CSIR-CFTRI on 5<sup>th</sup> February 2024. Dr. Aashitosh A Inamdar, Sr.Pr.Scientist, CSIR-CFTRI welcomed the gathering and briefed about the seminar. Technical talks were delivered on topics like evolution of grain processing machinery, CSIR-CFTRI's contributions to millet processing, women empowerment, milling etc. by faculty from CSIR-CFTRI, and retired scientists. Short video interactions with stakeholders of Millet Technologies were displayed. Dr. Sridevi Annapurna

Singh, Director, CSIR-CFTRI presided over the event.



## Selected Publications

- Padmanabhan V., Kumar S.S., Giridhar P., Phytochemicals and UHPLC-QTOF-HRMS characterisation of bioactives of butterfly pea (*Clitoria ternatea L.*) seeds and their antioxidant potentials, *Food Chem.*, 2024, 433, art. no. 137373. (IF: 8.8)
- Aswathi K.N., Shirke A., Praveen A., Pushpa S. Murthy., Functioning of *Saccharomyces cerevisiae* in honey coffee (*Coffea canephora*) and their effect on metabolites, volatiles and flavor profiles, *Food Res. Int.*, 2024, 180, art. no. 114092. (IF: 8.1)
- Karkal S.S., Jamadar A.S., Kudre T.G., Valorization of marine fishmeal industry oil as feedstock and calcined shrimp and crab shells as catalysts for production of biodiesels and evaluation of their fuel properties, engine combustion, performance and gas emission characteristics, *Process Saf. Environ. Prot.*, 2024, 182, pp. 443–455. (IF: 7.8)
- Saarika Pothuvan Kunnummal., Mahejbin Khan., Diet–gut microbiome interaction and ferulic acid bioavailability: implications on neurodegenerative disorders, *Eur J Nutr.*, 2024, 63 (1), pp. 51–66. (IF: 5.0)

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