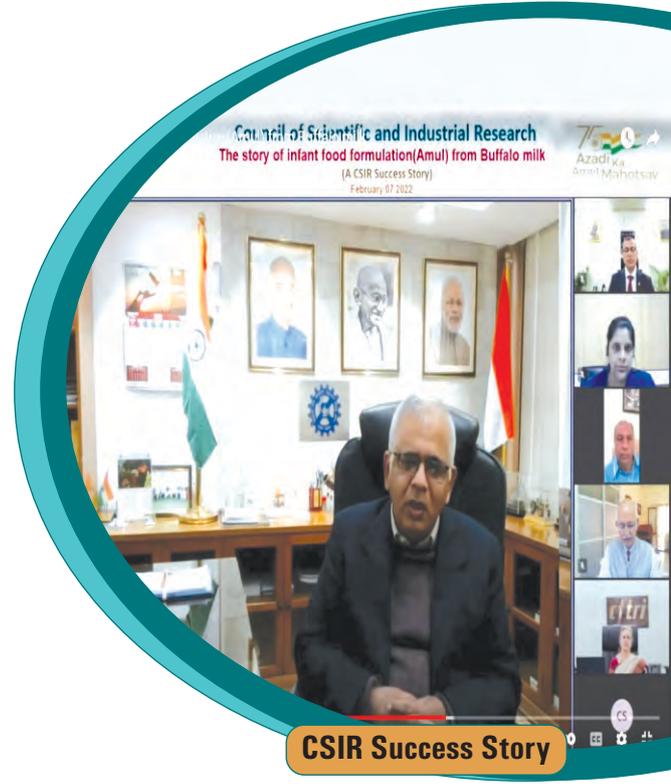


# FoodPro

Jan - Mar 2022

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



ಸಿ.ಎಸ್.ಐ.ಆರ್.-ಕೇಂದ್ರಿಯ ಆಹಾರ ತಾಂತ್ರಿಕ ಸಂಶೋಧನಾಲಯ, ಮೈಸೂರು  
ಸಿಇಸಐಆರ್-ಕೇಂದ್ರೀಯ ಖಾಘ ಪ್ರೌಢೋಗಿಕ ಅನುಸಂಧಾನ ಸಂಸ್ಥಾನ, ಮೈಸೂರು  
CSIR-Central Food Technological Research Institute, Mysuru

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## Research Highlights

### “RBC like” Self-assembled microparticles of chitosan derivatives (SAMC) for the in vitro cytotoxicity for breast cancer cell lines

The inhibition of angiogenesis has been considered advantageous for preventing tumor growth and decreasing their metastatic potential. In the present study, well characterized self-assembled chitosan microparticles (SAMC) was examined for the in vitro cytotoxicity for breast cancer cell lines. Self-assembled microparticles from chitosan (SAMC) was prepared by depolymerization induced by potassium persulfate. Particle size distribution data showed averaged around 5 µm size and SEM indicated the sequential formation of “RBC” shaped particles. Soluble SAMC consists of ‘deacetylated’ residues as revealed by 13C-NMR. SAMC showed antitumor efficacy in human breast cancer cell lines through mitigation in cell proliferation, colony formation and cell migration. Anti-tumor and anti-angiogenic properties of SAMC was found in vivo Ehrlich ascites tumor (EAT) bearing mice model resulting in tumor growth inhibition (EAT control, 17.4 ml; SAMC treated, 6.8 ml) and improved survival potency (15 days). The decrease in ascites VEGF secretion (EAT control, 1354 ng; SAMC treated, 351 ng) was observed accompanied with reduction in neo-vessel formation. Apoptosis induction by SAMC was confirmed by DNA fragmentation, caspase activities and fluorescence staining methods respectively. SAMC may be a safe candidate for anti-tumor dietary supplement production in food industry.

(Source: Punarvasu, T.P., Harish Prashanth, K.V. Self-assembled chitosan derived microparticles inhibit tumor angiogenesis and induce apoptosis in Ehrlich-ascites-tumor bearing mice, *Carbohydr. Polym.*, 2022, 278, art. 118941)

### Non-enzymatically hydrolyzed guar gum and orange peel fibre stabilize the low-fat, set-type yogurt: A techno-functional study

A combined integration of partially hydrolysed guar gum (PHGG) and orange peel fibre (OPF) into low-fat, set-type yogurt was explored. PHGG was produced using steam hydrolysis assisted by ultra-sonication while OPF (coarse fraction) was prepared from dried orange peels. PHGG and OPF were further studied for their structural, physical, physico-chemical and rheological characteristics. PHGG exhibited shear thickening and Newtonian behaviour while, OPF showed shear thickening and non-Newtonian behaviour. The size determination of PHGG and OPF adjudged them as fine and coarse fibres, respectively. Four groups of yogurt were prepared by varying the concentration of PHGG (0–0.5% w/v) while, OPF (0.1% w/v) was kept constant. PHGG and OPF formed complimentary fibre networks which stabilized the yogurt gel by acting as filler and bridging agent, respectively. PHGG 0.25% (w/v) + OPF fortified yogurt presented superior rheological, textural and physico-chemical properties in comparison to plain and other fortified yogurts during storage (28 days, 4 °C). The SEM showed that fibre fortified yogurts had more structured and compact casein network as compared to plain yogurt. Thus, it is evidenced that, fortification with a combination of dietary fibres could not only improve the techno-functional properties of low-fat, set-type yogurt but also provide health benefits of dietary fibre and phytochemicals.

(Source: Priyanka Rose Mary, Sarma Mutturi, and Mukesh Kapoor. Non-enzymatically hydrolyzed guar gum and orange peel fibre together stabilize the low-fat, set-type yogurt: A techno-functional study, *Food Hydrocoll.*, 2022, 122, art. 107100)

## IPR in the Horizon

### Colorimetric Reagent Kit for the Detection of Formaldehyde

Many industrial activities utilize formaldehyde as a key chemical in organic synthesis including: chemicals such as pentaerythritol and ethylene glycol, synthetic resins, paper products, medicinal products, drugs and others. Therefore, effluents arising from these applications may contain significant amounts of formaldehyde. Formaldehyde is also under discussion as an indoor air pollutant. Adverse health effects from indoor exposure to formaldehyde, especially irritation of the eyes and upper airways have been reported. Formaldehyde is a food adulterant which is added illegally to extend the shelf life of food commodities. Illegal formaldehyde addition has been reported in food commodities like fish and fish products, fruits and vegetables, wine, noodles, beers, milk etc. It has been classified as a Group I

carcinogen and has been implicated to have neurotoxic activity (IARC Monograph, 2006, 2008). Formaldehyde can potentially cause serious health effects which include among others nausea, vomiting, severe abdominal pain, renal and liver injury, coma and possible death. The present invention relates to a reagent system that can be used to detect formaldehyde in environment and food samples. The reagent kit body contains (i) Reagent A, which includes phosphate buffered saline, formaldehyde dehydrogenase (FDH); and oxidized Nicotinamide adenine dinucleotide (NAD<sup>+</sup>) (ii) Reagent B, which includes a solution containing auric chloride, gold nanoparticle, and Cetyl trimethyl ammonium bromide (CTAB). Sample and the reagents are mixed in a certain volume proportion and subjected to a series of reactions to develop color to get a qualitative result and can be compared to a color chart for a semi-quantitative measurement of formaldehyde (IN 202211019411).

## New Technologies

### Coffee Leaf Brew Mix

With the increasing popularity of innovative products based on coffee and its by-products, there is a growing importance for the utilization of coffee leaves due to its health beneficial properties. The phytochemicals viz., phenolics, alkaloids and flavonoids in coffee leaves contributing to health are well known. Coffee leaves are usually discarded as a by-product and valorization of the same can be achieved through development of value added products. CSIR-CFTRI has developed a technology, 'coffee leaf brew mix' wherein coffee leaves are used for the formulation of coffee leaf dip bags along with spices. The product has a unique sensory profile with delicate, herbal, sweet, spicy notes and appealing hue. Coffee leaf brew mix can contribute towards better health for consumers while promoting sustainable coffee industry benefiting the coffee growers and processors.



### Buckwheat Noodle/Pasta

There is an increasing popularity of buckwheat noodle/pasta owing to its unique taste and superior nutritional profile as compared to udon (white wheat flour noodles) and ramen (fried noodles). Buckwheat noodle/pasta are convenient and versatile extruded product which can be cooked in short time. It is made from a composite of buckwheat (*Fagopyrum esculentum*) flour and wheat flour having unique flavour, texture and appealing colour. The low moisture content (5 - 8 %) makes the product with good shelf-life. The noodle/pasta have better protein quality, higher minerals content and antioxidant property as compared to the common wheat noodle/pasta. It has a well-balanced amino acid composition especially the essential amino acid. The dietary fiber content is high (7 - 9%) and is rich in bioflavonoids particularly rutin and quercetin. There is a growing demand for buckwheat noodle/pasta in the market. Currently, imported buckwheat noodles from other Asian countries are seen in the market being sold at high price and it can serve as an import substitute in Indian market.



## Technologies Transferred

- ✦ Pulse based papads (Ms. Deepa N Kanabbaragi, Bailhongal)
- ✦ Shelf stable jowar flour (Sree Amarasishaa Ethnic Foods, Vijaypur)
- ✦ Desiccated coconut (Ms. G Tejaswini, Hassan)
- ✦ Layered parotta (South Indian), (Akshaya Foods, Mysuru; Glowing Sun Food Products Pvt Ltd. Bengaluru; ITF Fresh, Hyderabad; Good Food Provider, Belagavi)
- ✦ RTS fruit juice and beverages (Sree Lakshmi Ramana Beverages, AP; Sathpushti Supra Labs (OPC) Pvt Ltd, Bengaluru)
- ✦ Making superior quality of white pepper (Amphora Commodities Pvt Ltd, Chennai)
- ✦ Fermented and dehydrated ready mixes for dosa batter (Glowing Sun Food Products Pvt Ltd, Bengaluru)
- ✦ RTC multigrain whole mix for drink/porridge (PoustikAgro Food Products, Mysuru)
- ✦ Shelf stable chapati (ITF Fresh, Hyderabad)
- ✦ RTC multigrain whole mix for drink/porridge (Mr.Hariprasad B, Mandya)
- ✦ Spray dried refined papain (Vreen spro solutions LLP, Assam; Vijayalakshmi Industries Pvt Ltd, Coimbatore)
- ✦ Plant growth promoter containing n-triacontanol (Mysmart Agri Industries, Pune)
- ✦ Pickles and chutneys: preparation (Mr. Abdul Gafoor.K. A, Kodagu)
- ✦ Coffee leaf brew mix (S.L.N Coffee Private Limited, Kodagu)
- ✦ Pulse based papads (Mr. Sridhara, Mandya)
- ✦ Ragi based ready to cook malted weaning food & Ragi based papads (Maa Mission Shakti Federation, Odisha)
- ✦ Coffee flakes based mouth freshener (Mr. Muhammed Ishakh. P, Kerala)
- ✦ Fish Pickle, Fish Wafer & Prawn wafer (Shree Hot Spot Industries, Vijayapur)
- ✦ Preparation of beverage mix from malted ragi (Mr. Nagaraj M, Hoskote)
- ✦ Osmo-air dried fruits (Amla, Jackfruit, Pineapple & Mango), Potato flour, Mustard / Rape seed integrated processing (Jharkhand State)
- ✦ Processed besan (Bengal Gram Flour) for sev and boondi preparation, quick cooking, germinated and dehydrated pulses, Moulding machine for besan, soji/rava and similar laddus, RTE convenience food-Khakra, Ready mix: Pakoda, Dolymix, a ready to use mix for soft and enhanced number of Idlys (Jeyyam Global Foods Pvt Ltd, Chennai)

## Entrepreneurs Speak...

The Totgars' Cooperative Sale Society Ltd., Sirsi, popularly known as TSS Sirsi is a Farmers' cooperative society, established in 1923 at Sahyadri Town, Sirsi.

### Product Range and Brands

We have a wide range of consumer goods and flavoured cashew nuts (masala cashew, Spicy Cashew, Salted Cashew) under the brand name TSS Tiger.



### Vision and Challenges

Our vision is to reach the consumers across the country in providing better quality products and providing better market to our farmer members. Our biggest challenges are increased market competitions, changing market conditions and perceptions with respect to tastes.

### Role of CFTRI in catalyzing growth of our firm

CSIR-CFTRI has provided high quality know-how and flavoured cashew production process with utmost quality.

### Advice to Emerging Startups

Emerging Startups, who are looking forward for a wide range of consumers in RTE segment can depend on CSIR-CFTRI technologies and training.

## New Collaborations

### UPL Limited, Mumbai (Jan 31, 2022)

R&D projects on grain storage management, grain protection and pest control have been initiated as part of this collaboration.

### Prayoga Institute of Education Research, Bengaluru (Jan 31, 2022)

This partnership aims to improve education research by undertaking specific programmes and developing pedagogical methodologies for delivering novel learning experiences to schools and higher educational institutions.

### Coffee Board, Bengaluru (Feb 2, 2022)

Collaborative project has been initiated to assess the role of chicory in coffee, including acrylamide content screening of coffee and chicory, profiling study of brewed coffee and brewed coffee-chicory mixture.

### Raghunathpur Sub-Divisional Office, Purulia, West Bengal (Feb 16, 2022)

Under this collaboration, short-term nutrition intervention studies have been initiated by supplying weekly nutrition packs to SAM/ SU children in the

Raghunathpur Sub-division of Purulia District, West Bengal.

### North East Centre for Technology Application & Reach (NECTAR), New Delhi and Technology Information, Forecasting & Assessment Council (TIFAC), New Delhi (Feb 25, 2022)

The collaboration will facilitate supplying a Mobile Processing Unit (MPU) for the processing of fruits and vegetables at farm gate in North-East states.



### Mahatma Gandhi University, Kottayam, Kerala (Mar 24, 2022)

The MoU aims to achieve strategic positioning through collaborations between both the institutions in meeting the emerging scientific and technological challenges of the society.

## Events

### Azadi Ka Amrit Mahotsav Webinar Series

- ✦ A webinar on "Innovations and Advancements in Food Protection and Grain Storage" was conducted on January 5, 2022.
- ✦ Webinar on "Balanced Nutrition through Microbial Food Additives" was conducted on January 10, 2022. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided the session. Dr. Prakash M. Halami, Chief Scientist, CSIR-CFTRI rendered opening remarks and faculties from CSIR-CFTRI and universities delivered lectures.



- ✦ World Pulses Day lecture was held at CSIR-CFTRI on Feb 10, 2022. Dr. Sridevi Annapurna Singh, Director CSIR-CFTRI delivered the inaugural address on the occasion. Sri A. Srinivas, Chief Scientist, CSIR-CFTRI and Sri M. Arjunan, Technical Advisor, Jeyyam Global Foods, Salem delivered expert lectures on the occasion.
- ✦ Webinar on "Challenges in Food Safety and Quality Assurance" was held at CSIR-CFTRI on March 30, 2022. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI gave initial remarks. Dr. Chindi Vasudevappa, Vice Chancellor, NIFTEM was Guest of Honour. Dr. N. Bhaskar, Advisor, FSSAI; Dr. Pramod Siwach, Asst. Director, EIC; Dr. P. Nisha, Principal Scientist CSIR-NIIST; Mr. Shrinivasa Joshi, President, AOAC; Dr. A.K. Srivatsava, Chief Scientist, CSIR-CFTRI delivered lectures on the occasion.

## Integrated CSIR Skill Initiative

- ✦ The virtual workshop on "Intellectual Property with an Emphasis on Food Processing" was conducted on January 19, 2022 in which faculties from CSIR HQs, CSIR-URDIP and IP practitioners delivered lectures. A total of 50 participants from 15 states/UTs attended.



- ✦ An online workshop on '3Ps of Food Industry' was held during Mar 3-4, 2022. The programme was inaugurated by Mr. H.S. Sathish, Chief Scientist, CSIR-CFTRI and lectures were delivered by Institute scientists. A total of 178 people participated in the aforesaid training programme through virtual platform.
- ✦ A training programme on "Bakery Units for Urban & Rural markets; Bringing sustainability" was held on March 29, 2022 under this Initiative. A live streaming of preparation of bakery products was done. A total of 46 participants attended the above training programme through virtual mode.

## ICFOST (Jan 20-22, 2022)

The 28th Indian Convention of Food Scientists and Technologists (28th ICFOST) was organized by AFST(I) in association with CSIR-CFTRI & DRDO-DFRL. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI, delivered conventional talk entitled "Food Processing 2030: Is a Climatearian Diet the Way Forward?". Scientific lectures were delivered by faculties from various organizations /universities including CSIR-CFTRI on different themes in the workshop.

## The Story of Infant Food Formulation(Amul) from Buffalo Milk (Feb 7, 2022)

The webinar was inaugurated by Dr. Shekhar C. Mande, DG, CSIR. The panelists included Dr. V. Prakash, Former Director, CSIR-CFTRI, Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI, Dr. B.M. Vyas, Ex-MD, Amul Dairy, and Commodore Amit Rastogi (Retd.), CMD, NRDC. The event was organized under the banner of "Success stories of CSIR" in commemoration of 80 years of CSIR's existence.

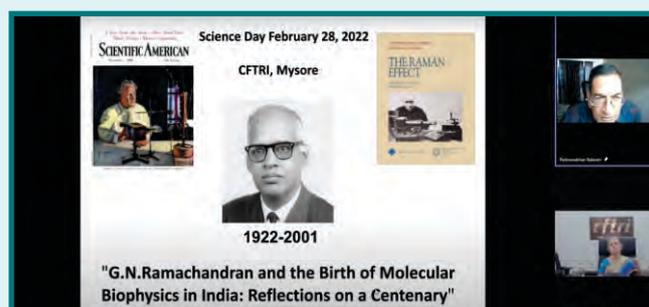
## Science Festival (Feb 22, 2022)

Vijnan Sarvatra Pujyate inaugural function was held at CSIR-CFTRI on Feb 22, 2022. The event was inaugurated by Prof. S K Brahmachari, former DG-CSIR and Dr. Sridevi Annapurna Singh, Director CSIR-CFTRI presided. The valedictory function was held on Feb 28, 2022 and prizes/awards were distributed to school children who participated in various competitions as part of the festival.



## National Science Day (Feb 28, 2022)

National Science Day was celebrated on Feb 28, 2022 at CSIR-CFTRI. Prof. P. Balaram, former Director, IISc, Bengaluru delivered the lecture, "G.N. Ramachandran and the Birth of Molecular Biophysics in India: Reflections on a Centenary". Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI welcomed the audience.



## Seminar on "Struggle for Swatantrata and the Science" (Jan 20, 2022)

On January 20, 2022, Shri. Jayant Sahasrabudhe, National Organizing Secretary, Vijnana Bharati, delivered the lecture.

## JIGYASA Outreach Programmes

- ✦ CSIR JIGYASA Scientist - Student connect program was conducted on Feb 28, 2022 & March 18, 2022 in which Food Adulteration Test Kit was demonstrated to over 300 students from Govt. High School, Kumbara koppalu & Marballi, Mysuru.



- ✦ JIGYASA Quiz programme was conducted on March 3 & 21, 2022 in which 45 students from JNV - Mysuru, Chamarajanagara, Mandya & Hassan participated

## International Women's Day (Mar 10, 2022)

International Women's Day was celebrated in which Dr. Viloo Morawala-Patell, Founder and Chairperson, Avesthagen Limited, Bengaluru was the Chief Guest of the function. Mrs. Marthamma

Mary, a woman auto driver of Mysuru City was felicitated on the occasion. Dr. Sridevi Annapurna Singh, rendered presidential remarks. Mrs. K. Kusuma, CSIR-CFTRI was honoured for achievements in the State level para swimming competition, where she won one gold and two silver medals.



## National Workshop (Mar 24-25, 2022)

A two-day National workshop "Bifidobacterial Probiotics: Supplementation through Fermented Food" sponsored by the Probiotic Association of India (PAI) was organized. Dr. Shrilakshmi Desiraju, Probiotic IP Advisor, TENSHI Life Sciences, Bengaluru was the Chief Guest. Dr. Prakash M Halami, Chief Scientist, CSIR-CFTRI briefed about the workshop and Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided.



## Visitors

- ✦ Shri P. Shekhar Rao, Member, KVIC and officials of KVIC (Bengaluru region) visited on Feb 3, 2022 and interacted with scientists on different issues like Lab to Masses.
- ✦ Prof. K. Sandeep Prabhu, Professor of Immunology and Molecular Toxicology, and Head, Department of Veterinary and Biomedical Sciences, The Pennsylvania State University, USA, delivered Invited talk entitled "Trace element selenium and its anti-inflammatory and anti-cancer effects" on March 16, 2022.

- ✦ Dr. Kerry Cooper, Assistant Professor, University of Arizona, USA visited the Institute on March 22, 2022 and interacted with scientists.
- ✦ Army Officer Trainees batch (Bengaluru) visited on March 23, 2022 as part of their training programme. After interaction, they were taken around to various facilities.
- ✦ Prof. P.V.G.D. Prasad Reddy, Vice-Chancellor & Prof. V. Krishna Mohan, Registrar, Andhra University, Vishakhapatnam visited the Institute on March 24, 2022 and discussed the possibility of initiating a few of other collaborative programs.

- ✦ Dr. Sudha Murthy, formerly Infosys Foundation, educator, author and Philanthropist visited CSIR-CFTRI on March 25, 2022 and interacted with scientific staff and students.



## Selected Publications

- ✦ Chegukrishnamurthi, M., Shekh, A., Ravi, S., Narayana Mudliar, S., Volatile organic compounds involved in the communication of microalgae-bacterial association extracted through Headspace-Solid phase microextraction and confirmed using gas chromatography-mass spectrophotometry, *Bioresour. Technol.*, 2022, 348, art. no. 126775. (IF: 9.642)
- ✦ Punarvasu, T.P., Prashanth, K.V.H., Self-assembled chitosan derived microparticles inhibit tumor angiogenesis and induce apoptosis in Ehrlich-ascites-tumor bearing mice, *Carbohydr. Polym.*, 2022, 278, art. no. 118941. (IF: 9.381)
- ✦ Mary, P.R., Mutturi, S., Kapoor, M., Non-enzymatically hydrolyzed guar gum and orange peel fibre together stabilize the low-fat, set-type yogurt: A techno-functional study, *Food Hydrocoll.*, 2022, 122, art. no. 107100. (IF: 9.147)
- ✦ Majid, A., Lakshmikanth, M., Lokanath, N.K., Poornima Priyadarshini, C.G., Generation, characterization and molecular binding mechanism of novel dipeptidyl peptidase-4 inhibitory peptides from sorghum bicolor seed protein, *Food Chem.*, 2022, 369, art. no. 130888. (IF: 7.514)
- ✦ Prakash, O., Baskaran, R., Chauhan, A.S., Kudachikar, V.B., Effect of heat processing on phenolics and their possible transformation in low-sugar high-moisture (LSHM) fruit products from Kainth (*Pyrus pashia* Buch. - ham ex D. Don) fruit, *Food Chem.*, 2022, 370, art. no. 130988. (IF: 7.514)

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

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