CSIR-CFTRI Newsletter

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Giving Food a Future

FoodPro

Oct-Dec 2020

Ready mix: Upma

Maize Chips

CSIR-CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE
(Council of Scientific & Industrial Research)
Mysuru - 570 020

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Message from Dr. Sridevi A Singh Director, CSIR-CFTRI

CSIR-CFTRI is the premier R&D Institution working in the area of Food Science & Technology for the last 7 decades. Over the years, the Institute has brought out many innovative and path-breaking solutions for the benefit of the consumers and Food Industry. And in this journey, it will be our passion and endeavour to contribute effectively aligning with the mandate in the areas of Food Security, Nutrition, Food Processing and Entrepreneurship. In view of it, a few of these priorities are indicated below:

Sustainable Development Goals (SDG) of UN are intrinsically linked with CSIR-CFTRI's mandate. R&D programmes and outreach activities of the Institute are intended to meet Employment Generation (SDG 1), Zero Hunger (SDG 2), Good Health and Wellness (SDG 3), and Gender equality (SDG 4) etc. In this respect, Value addition, Shelf-life extension and processing of agri-produce addresses enhancing farmer's income, creating livelihood opportunities including womenfolk.

CSIR-CFTRI continues to explore newer avenues in terms of making affordable nutrition through government and market interventions. The Institute has been working closely in association with Women & Child Development Departments of various State Govts. in reaching out to Anganwadi children and pregnant women (ICDS), School Children (Mid-Day Meals Scheme) for years. There is a large array of nutrition supplements developed and commercialized by the Institute as well.

With the changing consumer perceptions, newer products catering to different segments of the populations such as nutraceuticals, health beverages and immunity enhancing supplements are also our priorities.

Entrepreneurship has got utmost focus in the diverse portfolio of the Institute and programme such as Prime Minister Formalisation of Micro Enterprises (PMFME) aligning with One District One Product (ODOP) has taken off in a big way with the hand-holding of Farmers, FPOs and budding entrepreneurs. CSIR-CFTRI has been promoting startups with a series of Incubation Centres, Accelerator Facility along with a vibrant ecosystem to promote innovation. Further, the Institute has been aligning with major National Missions such as Aatmanirbhar Bharat, Skill India, Startup India, Swasth Bharat and so on.

In a nutshell, I would like to invite each one of you to join us in the Mission of realizing a self-reliant India, especially in the area of Food Processing.

Research Highlights

Prebiotic oligosaccharide fortified green coffee spent cookies

The residue produced after green coffee bean processing is called Green Coffee Spent (GCS). Since GCS residues are rich in prebiotic oligosaccharides, dietary fibers, ash, minerals, proteins and polyphenols (trigonelline, caffeine, theobromine, theophylline), they can be used as a food ingredient that will add value to the bakery and coffee industry. CSIR-CFTRI has developed a technique for the valorisation of spent green coffee (GCS) as food ingredient and its application in food products. After processing green coffee for chlorogenic acid, about 70% of the GCS was obtained. The cookies fortified with roasted green coffee spent (RGCS) and unroasted green coffee spent (UGCS) were evaluated for physicochemical properties and food safety. The UGCS and RGCS flour contained 3.3 ±1.08 and 2.6 ±0.21 percent dietary fiber, 8.29 ±0.05 and 16.34 µg/Mg total polysaccharides, along with equal quantities of ash and protein. The total polyphenols content of 36.4 and 32.6 mg/100g and antioxidant activity of 0.32 and 1.25% added nutritional values to the cookies. The UGCS and RGCS contained oligosaccharides at 4.76 and 8.29 µg/Mg respectively. Acrylamide was 23.4–37.8 ±0.3 lg ACR/kg d.m. in UGCS and RGCS cookies. In contrast with UGCS, the cookie formulations of RGCS had stronger sensory characteristics such as color and aroma. RGCS enriched with prebiotic oligosaccharide can be considered as a novel functional food supplement.

(Source: Nivas M. Desai., Bubly Mallik., Suresh D. Sakhare., Pushpa S. Murthy., Prebiotic oligosaccharide enriched green coffee spent cookies and their nutritional, physicochemical and sensory properties. LWT, 2020, 134, art.no:109924)

Food supplements targeting pathogenesis of COVID-19

COVID-19 is an acute and contagious disease characterized by ARDS and pneumonia. The disease is caused by SARS-CoV-2, which belongs to the family of Coronaviridae along with MERS-CoV and SARS-CoV-1. The virus has positive-sense RNA as its encoding genome for about 26 proteins that function together in the host for the survival, replication, and propagation of the virus. The details of SARS-CoV-2 infection pathogenesis are not well known, but clinical and research results indicate that COVID-19 pathogenesis includes two phases such as suppression of innate immune response and acute inflammation-driven damaging phase. Therefore, strategies to counteract the SARS-CoV-2 infection is to boost the immune response by food supplements. Most countries around the world are currently developing corona vaccines and there is still no specific drug for COVID-19 use, as well as extensive national and international evidence on the impact of dietary supplements on the incidence or severity of COVID-19. Several evidence shows that many nutritional supplements from different spices, herbs, fruits, roots, and vegetables can reduce the risk or severity of a wide range of viral infections by boosting the immune response, particularly among individuals with insufficient dietary sources, as well as by anti-inflammatory, free radical scavenging, and viricidal functions. The use of natural compounds and beneficial effects of certain nutrients such as Zn, Vitamin D, Vitamin C, curcumin, cinnamaldehyde, probiotics, selenium, lactoferrin, quercetin, etc. may therefore provide alternative prophylactic and therapeutic support in addition to COVID-19 therapy.

(Source: M. Mrityunjaya, V. Pavithra, R. Neelam, P. Janhavi, P. M. Halami and P. V. Ravindra., Immune-boosting, antioxidant and anti-inflammatory food supplements targeting pathogenesis of COVID-19. 2020, Front. Immunol.,)

IPR in the Horizon

Time Temperature Indicator (TTI) for freshness detection in perishable items

Many packaged foodstuffs have a limited shelf life, and such items typically will have 'use by' date on the label. The rate at which such products deteriorate depends on the temperature and the extent of storage. Therefore, it will be ideal to have a product-related packaging indicator that will respond to changing temperatures over time in the same way that the products also undergo. CSIR-CFTRI has

developed a “Time Temperature Indicator/Integrator (TTI)” to detect the freshness/spoilage of perishable items such as fresh meat, fresh fish, milk, juice, fruit and vegetables. It is based on micro-perforation that has time activation and monitors the spoilage/freshness of the product with visual color change. The indicator comprises of activation paper, micro perforated layer and indicator paper. All indicator matrix combined together, the device is activated on the spot by applying measured quantity of the activation liquid such as organic acids or bases on the activation paper. The uniqueness of this innovation is that it includes natural pH-sensitive dyes obtained from plant sources & agro-industrial wastes.

New Technologies

Anti-diabetic Low-glycemic foods (DiaLow -GI-53, DiaLow -GI-49 and DiaLow - GI-47) for diabetic patients

Metabolic complications like diabetes, obesity and heart related complications have increased drastically that needs to be countered by both clinical intervention as well as dietary therapy. The necessity of feasible formulations containing bioactive principles to manage metabolic disorders has led to the development of health foods. In this direction, CSIR-CFTRI has developed products that include: Antidiabetic barley, wheat and herb-based (DiaLow - GI-53, DiaLow -GI-49 and DiaLow - GI-47) low-glycemic (GI) preparations that delays the rise in the blood sugar level after consumption. It is mainly based on the traditional knowledge from Ayurveda with simple modern food processing technique, which can be easily adopted for large-scale industrial process. These products contain antioxidant bioactives like polyphenols, flavonoids and tannins. Products being low GI, slower the absorption of glucose from the intestine that results in lower fasting levels and reduced spikes in blood sugar after a meal. The mix also provides adequate amount of energy, fat, carbohydrate and protein. Further, these products are efficient in lowering the carbohydrate metabolizing enzymes DPP4, α-amylase and α-Glucosidase. Anti-diabetic food formulations developed (based on traditional knowledge from Ayurveda with modern food processing) contains bioactives found to lower blood glucose.

DiaLow -GI-49

DiaLow - GI-53

DiaLow - GI-47

A greener process for production of methylxanthines for food and other applications

Methylxanthines have been extensively used in the field of medicine including as adenosine receptors, phosphodiesterases, calcium release channels, and GABA receptors etc. They have also been reported for several bioactive properties viz., strong antioxidants, antimicrobials and anticancer agents. However, production of methyxanthines namely Theophylline (TP) and 3-methyl xanthine (3MX) is currently carried out by chemical synthesis. This process utilizes many hazardous chemicals. Microbial biotransformation leading to either pure or partially pure product containing methylxanthines is a greener alternative to the chemical based process and can find wide application in food and healthcare industry. A process for microbial production of

methylxanthines has been developed and successfully demonstrated at 50 L scale in bioreactors. The product has been tested for anti-cancer effects in cell line and animal models and shows promising potential to be positioned in health & "natural skincare" market. The technology was developed as part of DBT-BIRAC sponsored project under the "Waste to Wealth" (SPARSH) scheme. At present the technology readiness level (TRL) is 4.

Technologies Transferred

- Nutra chikki with added spirulina (Shreesakthi Okkoota(R), Tiptur; Shri Kollapuradamma Shreesakthi Sangha(R), Tumkur; Shri Annapoorneshwari Shreesakthi, Tumkur; Shree OnakeObavva Shreesakthi Sangha(R), Tumkur; Microcon Agro Products, Bengaluru; Fruganic foods Pvt Ltd., Kozhikode; V & V Foods, Hyderabad)
- Turmeric powder technology from fresh rhizomes (Mr. N. Ravi Kumar, Hyderabad)
- Pickles and chutneys: preparation (State Urban Development Agency (SUDA), Bhubaneswar; S.V. Amrutha Food Products Pvt Ltd., Nellore; Veerabadreshwara Home Industries)
- Full fat soya flour: Edible, bland soy protein concentrate (S V M Agro Products Ltd., Dindigul)
- Maize chips (Vinrap Agro Industries, Hubli)
- RTS fruit juice & beverages (Shivani Jonah Serrao, Moodbidri)
- Mutton pickle (P. Arya Subrahmanyam, Hyderabad)
- Coffee concentrate (C P Exports, Kushalnagar, Mysuru)
- Ready mix: Upma (Ajmi Flour mills (India) Pvt Ltd., Kerala)
- Modified atmosphere packaging of minimally processed vegetables (Sia Fresh Foods, Tamilnadu)
- Online fortification of atta or maida (M.K. Agro Tech Pvt Ltd., Mandya)
- Microbial inoculums for the management of coffee pulp effluent (Bloom Biotech, Chikmagalur)
- Cereal flakes-jowar (Ruchira Enterprises, Kurnool)
- Paan flavoured water (Kemps Pet Industries, Hospet)
- Roller milling process for semolina(sooji/rava) from millets and preparation of multi-millets semolina (Ms. Manasa, Mysuru)
- Instant rava idli mix from millets and multimillets semolina (Ms. Manasa, Mysuru)
- Preparation of beverage mix from malted ragi (Ms. Manasa, Mysuru)
- Spirulina choco bar & cereal bar (Microcon Agro Products, Bengaluru)
- Chikki/Nutra chikki (Mr. Deenadayalu, Chennai)
- Convenience flour from ragi suitable for stiff porridge (Motherhood Foods, Bengaluru)
- Preparation of ready to cook multigrain whole mix for drink/porridge (Mr. Guru Abishek Rajamanikam. Chennai)
- Chestnut based glutten free cookies, raw banana powder (Integrated management services, Mumbai)
- Groundnut (peanut) butter (Vyjayantham Industries and Traders, Ernakulam)
- RTS fruit juices and beverages, tomato products, Fruit jams & Jellies–preparation, Pickles and chutneys, Fruit syrups and squashes, Tutty-Fruity, Protein rich ragi vermicelli, RTE low fat flaked spicy maize /corn snack, Potato wafers/chips (DRDA, Odisha)

New Start-ups

- Mycovation India Pvt Ltd., is an alternative protein food tech start-up involved in transforming Mycelium into exciting food products that are nutritious, affordable and sustainable. The company is working on creating products that are better and disruptive by

seamlessly replacing conventional meat and dairy products into balanced diet, suited to ethical and cultural traditions.

- Naka Foods is aimed at developing micro-algae foods with impact on a more sustainable and healthier alternative. It uses high quality, naturally derived premium ingredient to create food products which is not only nutritious but also tasty. Their first product "4PMBar" has high quality, nutritious "algae-derived" spirulina and probiotics with a goodness and taste of chocolate to satisfy food cravings as an healthier alternative. It has been received extremely well in the market. Naka food has fully optimised its production and presently working on plant-based chicken meat products.

Entrepreneurs Speak

Nextnode Bioscience is an agri-biotech manufacturing enterprise based in Ahmedabad, Gujarat, India. It is an ISO 9001: 2015 company which was started in April, 2018 and has own state-of-the-art facility for production. The company is also a prominent supplier of neem seeds and neem oil to urea manufacturing companies viz., GSFC, IFFCO, KRIBHCO, Shri Ram Fertilizers & Chemicals (SRFC) and Kanpur Fertilizers & Cement Limited (KFCL) etc. Nextnode received best Agribiotech enterprises, 2019. The company is also engaged in quality production of different organic manures and growth promoters/stimulants.

Product Ranges and Brand

Neem cake fertilizer (Neem Kamal), Azadirachtin based biopesticides (Margosa Gold), Micronized neem based biopesticide and Nitrogen saver (Margosa Plus), Soybean bioactive peptide fertilizer (Soyprotein hydrolysate), Nexamino, Triacontanol, (Nextrico) Microbial consortium (Biofertilizer) and Nexnitro.

Vision & Challenges

The company is focusing on production of research based, authentic and approved organic inputs (bio-fertilizers, growth promoters, biopesticides/ biofungicides and organic manures) for safe, healthy and sustainable agriculture to replace the chemical fertilizers/pesticides.

The main challenges faced by commercial developers is varying agro-climatic and environmental conditions, such as temperature, rainfall, soil type, cultivar, which change from one field/location to another.

Role of CSIR-CFTRI in Catalyzing Growth

With the assistance of CSIR-CFTRI, we have developed an effective formulation for nitrogen supplements (soy-protein bioactive peptide fertilizer) for organic farming which is showing prominent results. Moreover, plant growth promoter, triacontanol also showed very effective results in tea crops, castor, groundnut and other vegetable crops and generate more revenues for our company.

Advice for New Startups

New startup should enter market with novel/innovative products taking guidance from prestigious R&D organizations such as CSIR-CFTRI, ICAR-IIHR and BARC etc. Their endorsement can make a product trustworthy and create difference in the market. Technologies of R&D organizations can provide start-ups visibility in the competitive market and create technical barrier in the quality with other existed products.

New Collaborations

Clevergene Biocorp Pvt Ltd., Bengaluru (Nov 9, 2020)

CSIR-CFTRI initiated a collaborative project to study insights from Sars-CoV-2 viral genome sequencing of samples of RT-PCR positive patients.

MoU related Activities

Under the scope of the MoU signed between Grassroots Research and Advocacy Movement (GRAAM) and CSIR-CFTRI the following activities were initiated.

- S&T support to the beneficiaries identified by GRAAM
- Evaluation of existing manufacturing facility at "Asare Food Products", a women SHG of Bilikere village near Mysuru
- Two of the technologies viz. Malted Weaning Food (RTC) and Convenience Flour suitable for stiff porridge were transferred to the target group. Participated in the Stakeholder's consultation meeting and a training program was arranged.

Events

CSIR-CFTRI Foundation Day (Oct 21, 2020)

The Foundation Day Lecture on "Workspace Wellness and Profile of Heart Diseases in India"

delivered by Chief Guest, Dr. C.N. Manjunath, Director, Sri Jayadeva Institute of Cardiovascular Sciences & Research, Bangalore. The Guest of Honour, Shri Harsha Kikkeri, CEO, HoloSuit, Mysore and Shri Jitendra J Jadhav, Director, CSIR-CFTRI was present. The Annual Institute Awards were announced on the occasion as detailed below:

- Best Research Publication Award : Pramod Kumar P., Harish Prashanth K.V. Low molecular weight chitosan (~20 kDa) protects acrylamide induced oxidative stress in D. melanogaster by restoring dopamine and KIF5B levels, Carbohyd. Polym. 222, 2019, 115005.
- Best Publication Award for Applied Research : Sijil P.V., Adki V.R., Sarada R., Chauhan V.S., Strategies for enhancement of alpha-linolenic acid rich lipids in Desmodesmus sp. without compromising the biomass production. Bioresour. Technol., 294, 2019, 122215.
- Best Student Award-M.Sc. (Food Technology): Ms. Aarthi A.R.
- Best Student Award-ISMT: Mr. Mohamed Umair Muhammadh Imran
- Best Technology Transferred-Award: Dr. Suresh D. Sakhare & Team
- Individual Award for Maximum ECF generation: Dr. Pushpa S. Murthy

Vigilance Awareness Week (Oct 27-Nov 2, 2020)

Dr.(Smt.) Suman D. Pennekar, IPS Superintendent, A.C.B. & Deputy Director, Karnataka Police Academy, Mysore, delivered the Vigilance Day message. Prizes were distributed to the winners of various competitions conducted as part of the celebrations. Vigilance activities report was presented by Shri. DJN Prasad, Vigilance Officer & Administrative Officer of the Institute.

Kannada Rajyotsava Day (Nov 1, 2020)

Kannada Rajyotsava celebration was conducted on November 1, 2020 organised by CSIR-CFTRI and Kannada Sahrudaya Balaga. The Rajyotsava message was given by Dr. B. Manohar, Chief Scientist & Advisor (M&A) on the occasion.

SciFinder Training (Nov 26, 2020)

CSIR-CFTRI Library arranged a SciFinder Training Webinar in association with American Chemical Society (ACS).

IISF 2020 (Dec. 3, 2020)

Curtain Raiser event of IISF 2020 was conducted on Virtual platform on the theme “Science for Self Reliant India and Global Welfare” wherein Opening Remarks was given by Shri Jitendra J. Jadhav Director, CSIR-CFTRI. Dr. B. Manohar, Chief Scientist & Advisor(M&A) were present. Successful Women entrepreneurs, Smt. Chaya Nanjappa, Managing Partner, Nectar Fresh Pvt Ltd., SreeLakshmi Desiraju, CEO & Co-Founder, Triphase Pharmaceuticals Pvt Ltd., Smt. Revathi Jagadeesh, Founder CEO, SaRedh Enterprises; Dr. Sushma Appaiah, CEO & Founder, Golz Nutrition, delivered lectures in the technical session.

The webinar was aimed to enhance the usage of various resources among the user community.

Visit of Delegations

Hon’ble Agriculture Minister, Govt. of Karnataka Sri. B.C. Patil and Hon’ble District-in Charge Minister Sri. S.T. Somashekhar visited CSIR-CFTRI on October 16, 2020 and interacted with scientists on food processing and avenues for value addition to agri-produces.

Colloquium (Dec 28, 2020)

Virtual Colloquium on "Revisiting the Development of Infestation Control and Protectants Research" was held on Dec. 28, 2020 organised by Pesticide Science Study Group and CSIR-CFTRI. Dr. B. Manohar, Chief Scientist & Advisor (M&A) presided over the function.

Selected Publications

- Sijil P.V., Adki V.R., Sarada R., Chauhan V.S., Stress induced modifications in photosystem II electron transport, oxidative status, and expression pattern of acc D and rbc L genes in an oleaginous microalga *Desmodesmus sp., Bioresour. Technol.,* 2020, **318**, art. no. 124039. (IF: 7.539)
- Karkal S.S., Kudre T.G., Valorization of fish discards for the sustainable production of renewable fuels, *J. Clean. Prod.,* 2020, **275**, art. no. 122985. (IF: 7.246)
- Chegukrishnamurthi M., Shahabazuddin M., Sreevathsan S., Sarada R., Mudliar S.N., Ozonation as non-thermal option for bacterial load reduction of *Chlorella* biomass cultivated in airlift photobioreactor, *J. Clean. Prod.,* 2020, **276**, art. no. 123029. (IF: 7.246)
- Sravan Kumar S., Chauhan A.S., Giridhar P., Nanoliposomal encapsulation mediated enhancement of betalain stability: Characterisation, storage stability and antioxidant activity of *Basella rubra L.* fruits for its applications in vegan gummy candies, *Food Chem.,* 2020, **333**, art. no. 127442. (IF: 6.306)

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