

FoodPro

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

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Focus Theme: Post Covid Food Industry

Challenges & Opportunities

Covid is a mega accident in the history of time that has shaken developed and developing Nations alike. Neither poor nor rich are spared. All sectors of industry have been faced the brunt of its effect. Let us see food industry which is of our primary interest as well as consumers.

Although recession started all over the world even before Covid, Food Industry was more or less stable and maintained a reasonable growth rate. Food being a necessary and essential commodity, even in Covid it remains the same or even shown newer awareness to be explored. Courtesy Covid, the consumer preferences have changed significantly and no more remains the same. They have become more health conscious. So health and wellness foods are the current and future needs. Functional and nutritional foods that give immunity against pandemics like Covid is on the top of customer's priority. Indian traditional cuisine appears to be very handy, as it involves several spices, in contributing to much lower mortality rate in comparison with even developed nation with

much better health infrastructure. Nutraceuticals and naturals with roots in Ayurveda and traditional home remedies is the newer trend for food industry.

Supply chain of both raw material (agri produce) and finished products are severally affected due to Covid situation. This makes it necessary to look for local production for consumption. Food industry has to gear up to this challenge quickly.

In the changing Covid scenario, most of the immigration workers have returned to their native villages. This is a challenge as well as an opportunity. It is a challenge for the existing industry in the urban centres. It is an opportunity for creation of rural entrepreneurship for which food processing fills the bill very well. Starting MSME clusters in food processing is easier than other industry especially with the new schemes of Government.

In conclusion, food industry should look for innovative solutions in the Covid situation to face the challenges and to convert them into opportunities. Still food industry has the potential to become the sunrise industry in years to come.

(By Dr. Raghavrao KSMS, Director, CSIR-CFTRI)

Research Highlights

Extraction of phycocyanins from *Spirulina maxima*

Microalgae *Spirulina* has been considered as a complete food with future potential as it contains β -complex, γ -linoleic acid, nutraceutical pigments, very high protein content with a good vitamin and mineral balance besides having appetite suppressant properties. Among different species of Cyanobacteria, *Spirulina maxima* has highest protein. The proteins present in *S. maxima* are brilliantly coloured, hydrophilic and stable fluorescent protein pigments which are classified into three main groups: C-Phycocyanin (deep blue), A-Phycocyanin (bluish green) and Phycoerythrin (deep red) depending on their absorbance properties and inherent color. Phycobiliproteins are accessory photosynthetic pigments that participate in efficient energy transfer chain in photosynthesis. These proteins extracted from *Spirulina* sp. have numerous beneficial properties such as hypocholesterolemic effect, antioxidant immunomodulatory activity, anti-herpes simplex virus activity, body weight reducing ability, antimutagenic potential, anticoagulative and antithrombotic activity and arsenic-induced toxicity.

Phycobiliproteins being intracellular, different cell disruption methods are employed to get the crude extract. These methods can be broadly classified

into mechanical and non-mechanical methods. Most of the conventional mechanical methods (maceration, homogenization, grinding, etc.,) are shear based. Shear based methods have purity of phycobiliproteins extracted from *S. maxima* (0.15-0.75) and *S. platensis* (0.8). These methods result lower purity values as they leave the biomass broken, thus releasing the contaminant proteins from other organelles. For further processing, dry biomass of *S. maxima* has been selected as the wet biomass of microalgae as perishable in nature.

Extraction of C-phycocyanin (C-PC) and Allophycocyanin (A-PC) from dry biomass of *S. maxima* was carried out using ultrasound-assisted extraction (UAE), enzyme-assisted extraction (EAE) and their combination. The latter method of extraction resulted in the highest yield and purity of these compounds followed by the former and combination of these two methods. The highest yield, purity and extraction efficiency achieved were 44.5 mg g⁻¹d.b, 2.0 and 93 % for C-PC, and 29.93 mg g⁻¹d.b, 0.89 and 75 % for A-PC, respectively, under standardized conditions of UAE (1:15 solid – liquid ratio, 20% amplitude and 4 min ultrasonic time). Ultrasonic-assisted extraction was possible with the highest extraction efficiency of 93% (C-PC) and 75% (A-PC) which can be scaled up by using the already existing large scale ultrasonication units.

(Source: Chandralekha Devi A., Tavanandi H.A., Govindaraju K., Raghavarao K.S.M.S., An effective method for extraction of high purity phycocyanins (C-PC and A-PC) from dry biomass of *Arthrospira maxima*. *Journal of Appl. Phycol.*, 2020, **32**, 1141–1151)

New Technologies

Technology for Flavoured Water

Spice/flavoured water is a beverage of water with added natural/artificial flavours, herbs and sweeteners. Spice/flavoured water infused with spice extracts or natural flavouring serves as a refreshing healthy alternative to sodas, colas, juices and other sweetened beverages. Moreover, the presence of flavours, juices, extracts and even bioactive compounds from the herbs or spices could also provide some antioxidant properties which is an important feature for the prevention of diseases. Herbal water makes zero calorie flavoured water by infusing organic herbal extracts in pure water with no sugars, sweeteners, preservatives, and additives. Plants particularly,

spices are considered as one of the most important sources of medicine and they have been used for different ailments of human beings from the beginning of the civilization. Flavoured/spice water focuses on health benefits such as improved immunity and energy boosting, thereby gaining popularity among the consumers. Trials were carried

out to standardize the emulsified Herbal/Spice oil and Menthol stock solution. Storage of 120 days confirmed that the product is free of *Salmonella*, *coliform*, *yeasts* and *moulds*. This would propel consumers to choose a healthier way over commercially available sodas and other beverages.



Technologies Transferred

- ✦ Rural based biotechnological production of Spirulina (Mr. Ganesh Hegde, Uttarakannada)
- ✦ Groundnut-Peanut butter (Melmio Foods, Kerala)
- ✦ Osmo-air dried Fruit-Pineapple (Jonah Nigel Serrao, Mangalore)
- ✦ Preparation of Ready to Cook Multi grain whole mix for drink/ porridge (Vivek Traders, Mangalore)
- ✦ Bottling of Sugarcane Juice (Kanergy Foods & Beverage, Odisha)
- ✦ Nutra chikki with added Spirulina (Aquaseal Technologies and Infra Project Solutions, Mysuru; Kanti Sweets, Bengaluru; Jyothiraditya Biosolutions Ltd., Mysuru)

Entrepreneur Speak

"Om Shakthi Mahila Sangha" an SHG at Appasandra village, Narsapura Hobli, Kolar District which is supported by SCANIA under Corporate Social Responsibility (CSR) and Spirulina Foundation, Tumkur for production of Spirulina chikki. The SHG is marketing chikkis to their neighbouring villages as well.

Vision & Challenges: Market linkage and investments to scale up operations are the major challenges.

Role of CFTRI in catalyzing growth of your firm:

CFTRI is helping in troubleshooting the operations in improving the product and marketing leads. Further, CFTRI has been guiding our vision of combating malnutrition while generating livelihood in rural areas. We have reached out to hospitals in Mysuru, Tumkur and Hassan through Spirulina chikkis as a healthy snack cum immunity booster.

Your advice to emerging startups: Make use of CFTRI's expertise to address the challenging times of the nation and society at large.

New Collaborations

MGM's Institute of Biosciences and Technology, Aurangabad (Mar 11, 2020)

Both the institutions have agreed to work together for student exchange, joint research with support of external funding agencies.



BAIF Development Research Foundation, Pune (Mar 14, 2020)

CSIR-CFTRI initiated collaboration with BAIF's foundation for conducting research and outreach activities that will result in the introduction and

adoption of innovative, cost-effective, convenient and hygienic food technology solutions. Further trainings for small-scale food processing extension aids for the benefit of rural communities will be covered under this programme.

Davangere University, Davangere (Mar 18, 2020)

This MoU is intended to take up R&D projects jointly for establishment of a pilot plant for food processing through external funding and development of value added food products from locally available food sources.

Indian Association for the Cultivation of Science (IACS), Kolkata (May 28, 2020)

MoU addresses synthesis, spectroscopic characterisation of Calixphyrins and/ or Porphyrin class of macrocycles and their analogs and de novo design of FFR and metal sensing structures.

Schevaran Laboratories Pvt Ltd., Mysuru (May 29, 2020)

This MoU intends to develop affordable and cost-effective hygiene formulations to benefit the population in combating microbial infections and contaminants, promote herbal-based and eco-friendly cleaning and hygiene formulations to maintain safe workplace environment in industrial premises.



Karnataka Science and Technology Academy, Bengaluru (June 25, 2020)

This MoU is aimed at providing the foundation and structure for inculcating scientific temper across civil society through science communication, technology dissemination through Academia-Farm-Industry interface with a focus on rural areas, organising conferences and outreach programs.



Happenings

Covid 19 outreach efforts

CSIR-CFTRI launched a series of outreach efforts to mitigate corona virus pandemic in the country. These include, augmenting the Covid Testing at Mysore Medical College (MMC&RI) and Mandya Institute of Medical Sciences (MIMS), hand sanitizers to front-line Covid warriors including hospital staff and RTE food supplements to the migrant population stuck in major cities due to lockdown. The Institute networked with large number of organisations including government departments, Industries and NGOs across the country.

Testing services

- ✦ The Institute provided two RT-PCR and one automated RNA extraction units to scale the Covid testing facility established in Mysore Medical College & Research Institute (MMC &



RI) in the first week of April, when the Covid infections were on the rise in Mysore. Further, the centre was then testing the samples collected from neighbouring districts also. With the intervention, the Testing lab could test a maximum of 500 samples in a day. The Institute also provided a Refrigerated Centrifuge unit to Mandya Institute of Medical Sciences (MIMS) to start Covid testing facility in the month of June 2020.

RTE food supplements

- ✦ CFTRI distributed Ready-to-Eat (RTE) food products manufactured using CFTRI's technologies in association with government departments and NGOs during the lockdown period. The beneficiaries included migrant labourers, Covid warriors, State police force across cities such as Delhi, Bangalore, Mandya and Mysore. Almost 40 tonnes of food material were supplied which included High Protein Biscuits (11 tonnes), High Protein Rusks (6



tonnes), Fortified Mango & Fruit bars (6 tonnes), Spirulina chikki (1.75 tonnes) and Flavoured water (15 tonnes). The food was manufactured by CFTRI's licensees as per the Institute's specifications and supply chain logistics was provided by Government agencies such as Income Tax Department (Bengaluru), Indian Society of Agriculture Professionals (ISAP), New Delhi, Zila Panchayat (Mysore & Mandya) etc.

Hand sanitizers

- ✦ The Institute prepared hand sanitizers as per WHO specifications and distributed to local Administration, Holdsworth Memorial Hospital, Mysore and State transport services.



Fumigation services

- ✦ Phosphine fumigation is the prominent technique used to manage stored product insect pests worldwide. Accordingly, CFTRI team carried out fumigation of stored grains at JSS Technical Institution campus and JSS women's College in Mysore, during lockdown period.

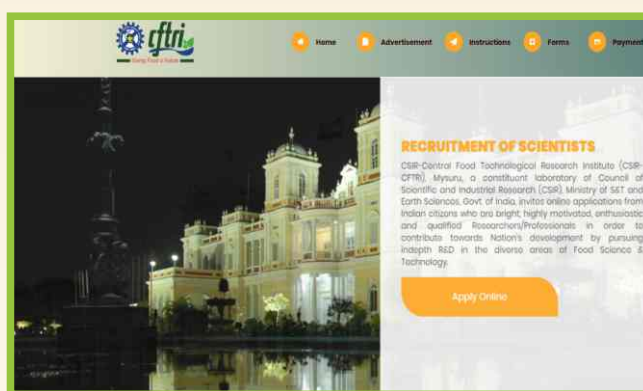
Ready-to-eat food during Amphan cyclone

CSIR-CFTRI despatched ready-to-eat, instant food mixes, and bakery products for distribution to Amphan cyclone victims. Dr. Raghavarao KSMS, Director, CSIR-CFTRI said, "We are more than happy to help, but pray that such instances are rare and far apart in time," indicating how the back-to-back calamities affect people's lives. The Institute despatched a total of 39 tonnes of food products to Kolkata such as ready-to-eat vegetable pulav and sambar rice (14 tonnes), instant poha (5 tonnes) and high protein biscuits (15 tonnes). The Nestle India Ltd., Nanjanagud also contributed maggi noodles (5 tonnes) under its corporate social responsibility programme. CFTRI licensees such as Praveen Masalewale, (Pune), MTR Foods Ltd., (Bengaluru) and Seven Pillars Pvt Ltd.,

(New Delhi), manufactured the instant meals, RTE meals and biscuits. The food products were delivered at the Office of Principal Secretary, Govt. of West Bengal.

CSIR-CFTRI Recruitment Portal

An online portal for the development of unified recruitment platform across CSIR laboratories has been developed by CFTRI using open source platform and tools. The modules include: Registration, Filling up the basic information, Validation, Uploading and Instant communications. The Management interface



comprises, posting position-wise details, criteria settings, Customizable filters, Generation of synopsis; Proceedings, Call letters, Consolidated score card and Offer letters. The software has been successfully implemented in the recent recruitment process of the Institute.

IRINS @ CSIR-CFTRI

IRINS, a web-based Research Information Management (RIM) service provided by the Information and Library Network (INFLIBNET)



Centre, has been hosted at CSIR-CFTRI website. This portal facilitates the academic, R&D organisations and faculty members, scientists to

collect, curate and showcase the scholarly communication activities and provide an opportunity to create the scholarly network. It enables the research related metadata more discoverable, inter-operable and re-usable in the

scholarly communication ecosystem. The key features of the application include: Dashboard, Academic Identity, Citation, Analytics, Network, Social Media Metrics etc.

Events

International Training Program (Mar 4-18, 2020)

CSIR-CFTRI organised an International Training Program on “Food Processing and Value Addition Technologies for Agripreneurship” under Feed the Future India Triangular Training (FTF-ITT) programme in association with MANAGE, Hyderabad. 23 International participants from Africa and South Asia attended the programme.



Future India Series

As part of the “Future India Series”, Dr. Shekar C. Mande, Director General, CSIR and Secretary,



Department of Scientific and Industrial Research, New Delhi delivered lecture, 'In science we trust' on Mar 9, 2020. Dr. Mande, in his talk, elucidated how “Science is looked upon as esoteric and difficult to comprehend. This apprehension about science and scientists, is misplaced.” The benefits science

and research have bestowed on society as well as the current research programs that are underway were highlighted.

International Women's Day (Mar 11, 2020)

CFTRI women employees' association celebrated International women's day on Mar 11, 2020. The chief guest of the event was Padmashree Salumarada Thimmakka and was presided over by Dr. Raghavarao KSMS, Director, CSIR-CFTRI.



National Technology Day (May 11, 2020)

CSIR-CFTRI celebrated National Technology Day on May 11, 2020 in association with Swamy Vivekananda Youth Movement (SVYM), Mysore. On this occasion, Dr. R. Balasubramaniam, Founder, SVYM delivered the talk on “What do villages expect from Food Scientists?”

Delegations

23 International delegates visited the Institute on Mar 12, 2020 as part of 44th FTF-ITT programme on “Production and Post-Harvest Management in Horticultural Crops” organised by UAS Bengaluru and UHS Bagalkot.

Awards

Mrs. Bhavya ML, Doctoral student (Guide: Dr. Umesh Hebbar H, Chief Scientist) won 3rd Prize in "Augmenting Writing Skills for Articulating Research (AWSAR)" for the year 2019 under the mentorship of Shri KVSAS Sharma, Chief Scientist and Coordinator, Information and Publicity.

AWSAR is a National Level competition initiated by Department of Science and Technology (DST) to disseminate Indian research stories among the masses, in an easy to understand and interesting format.



Webinar

A webinar was organised by CSIR - CFTRI in association with CII (Mysuru & Mangalore chapters) on the topic "Impact of Covid on Food Processing Industry and the way forward" on June 17, 2020 in which over 35 entrepreneurs,

FPO representatives and cashew processors attended. Expert lectures were delivered in session on Packaging, Safety and FSSAI guidelines.

Selected Publications

- ✦ Anis M.A., Sreerama Y.N., Inhibition of protein glycoxidation and advanced glycation end-product formation by barnyard millet (*Echinochloa frumentacea*) phenolics. Food Chem., 2020, **315**, Article number 126265. (IF: 5.399)
- ✦ Veeresh T., Naveen J., Baskaran V., Chitosan-oleic acid-sodium alginate a hybrid nanocarrier as an efficient delivery system for enhancement of lutein stability and bioavailability. Int. Journal of Biol. Macromolecules, 2020, **150**, 578-594. (IF: 4.784)
- ✦ Lamdande A.G., Mittal R., Raghavrao K.S.M.S., Flux evaluation based on fouling mechanism in acoustic field-assisted ultrafiltration for cold sterilization of tender coconut water. Innov. Food Sci. Emerg Technol., 2020, **61**, Article number 102312. (IF: 4.085)
- ✦ Arpitha H.S., Ganesan P., Lutein reverses hyperglycemia-mediated blockage of Nrf2 translocation by modulating the activation of intracellular protein kinases in retinal pigment epithelial (ARPE-19) cells. Journal of Cell Commun. & Signal., 2020, **14(2)**, 207-221. (IF: 3.691)

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