

FoodPro

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It gives me a great pleasure to present the CFTRI **FoodPro**, the Newsletter of CSIR-Central Food Technological Research Institute (CSIR-CFTRI), located at Mysore, under the aegis of Council of Scientific and Industrial Research, New Delhi. The CSIR-CFTRI is a unique laboratory that focuses on the research and development activities related to everything and anything related to food directly or indirectly under one roof.

CFTRI **FoodPro** highlights the major activities in the last 3 months (October to December, 2019). This issue covers some of the latest technologies developed and the technologies transferred to industry. Startups and Young Entrepreneurs are finding the Incubation Centre at CFTRI very useful especially the analytical and pilot plant facilities besides mentoring by senior scientists. It provides the space for entrepreneurs speak their mind and experience on campus.

Days are gone that we work in silos. The collaboration and cooperation is the order of the day. In this direction, a few MoUs were signed for co-development of processes / products besides turn-key assignments. Details of Short Term Courses, Skill Development Programs are also presented. Some of the important events such as Science Festival, CFTRI Foundation Day, Vigilance Awareness Week, Kannada Rajyothsava, Students and Farmers Programmes also covered in this issue. A few of the high impact factor research publications are listed.

For further details of any of our activities, technologies, products, our website may be consulted.

Dr. KSMS Raghavarao

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Probiotic Yeasts for *Candida* Infections

Candida infections, the most prominent etiologic agent, poses a major threat to public health, especially in healthy people with implanted medical devices. Impairment of immune functions helps the pathogen to infiltrate the digestive tract's submucosal tissue and spread it to the internal organs, contributing to life-threatening systemic infections. As an alternative approach to combating these common non-albicans, yeast-based probiotics are particularly desirable because they are naturally resistant to most of the antibiotics thus allowing them to survive in the gastrointestinal (GI) tract throughout antibiotic regimen. The effect of two yeasts, *Saccharomyces cerevisiae* (strain KTP) and *Issatchenkia occidentalis* (ApC), has been

shown in this research to prevent the adhesion and development of biofilms of five non-albicans *Candida* strains such as *Candida tropicalis*, *Candida krusei*, *Candida glabrata*, *Candida parapsilosis*, and *Candida auris*. These findings suggest that yeasts derived from food sources may serve as an effective alternative to antifungal therapy against emerging pathogenic *Candida* organisms. The results has the potential to impact on the current trend of converting conventional antimicrobial therapy to beneficial antimicrobial treatment with probiotic microbes.

(Source: Kunyeit L., Kurrey N.K., Anu Appaiah K.A. and Rao R.P., 2019. Probiotic Yeasts Inhibit Virulence of Non-albicans *Candida* Species. *mBio* **10**, e02307-19)

New IPR in the Horizon

Bug-Buster for Food Safety

An antimicrobial protein / Bug-buster has been identified from fermented foods by CSIR-CFTRI. Bug-buster kills most of the pathogenic microbes such as *Salmonella*, *Listeria*, *Vibrio cholera* and *Pseudomonas*. This can be introduced as an ingredient in the food so that extra sterilization is avoided. It is functional at harsh conditions such

as high temperature and pH (ranging from 2-9). The proteins will have applications as a antimicrobial agent and therapeutic protein for diary, meat, vegetables and fisheries industry.

(Source: A process of preparation of *Bacillus* antimicrobial peptide (BAMP) useful for food industry, Rajagopal K., 2019 (IN11008486))

Latest Technologies

Banana Bar

Banana is one of the largest produced fruit in the country and mainly consumed as fresh. It is a good source of carbohydrates, carotenoids, soluble and insoluble dietary fiber. Banana pulp extracted from mature ripe banana can be used for the manufacture of banana bar. The excess production of banana results in drop in prices and difficulty in marketing, hence there is a need for development of value added product from banana. Banana bar is highly acceptable with chewy texture, color and overall quality. The bar can be consumed as confectionary product and can be used as a concentrated source of energy in

special rations designed for mid-day meal and defence requirements. It is suitable for consumption by children, adults, teenagers and aged people. Shelf life of the product is about 6 months. Banana bar is a good source of energy and micro nutrients.



Nutritional Facts	Per 100g	Per 20g
Energy (K Cal)	210	42
Carbohydrates (g)	55	11
Zn (mg)	15	3
Fat (g)	ND	ND
Net Weight	: 20g	

DOLYMIX - ready to use mix for soft and enhanced number of Idlys

CFTRI has commercialized technologies for shelf stable, ready to use idly/dosa batter in retail packs since 2001. Considering its commercial success and the growing global market of idly and dosa consumption, CFTRI has introduced a ready to use mix for soft and more number of idlys. Dolymix is an ingredient prepared from processed grains to provide soft idlys and dosas. This increases the number of idlys upto 20% more and absorbs sambar easily. This mix will be added at the end of the grinding process and can be used in any proportion of rice and urad dhal. Dolymix can be used at home, in commercial (hotel)

establishments and also in dry mixes. The product can be marketed as a B2B or B2C format. As of now, no similar products are available in the market.



Technologies Transferred

- ◆ Carbonated fruit beverages from selected fruits - Mango and grapes (Sareth Enterprises, Bangalore)
- ◆ Carbonated fruit beverages from selected fruits - Orange and grapes (Kali Aerated Water Works Pvt. Ltd., Chennai)
- ◆ Wafers: Fish, prawn and egg (Vinanth Enterprises, Bangalore)
- ◆ Online fortification of atta - Whole wheat flour / Maida - Refined wheat flour (Seshu Nutrition Pvt. Ltd., Shillong)
- ◆ Modified atmosphere packaging of minimally processed vegetables, onion, cucumber, potato, lady's finger and green leaves (Bon Bojanam, Bangalore)
- ◆ Chikki / Nutra chikki (Hanbal Chikki, Hassan)
- ◆ Preparation of ready to cook multi grain whole mix for drink / porridge (Karnataka Health Promotion Trust, Bangalore)
- ◆ Shelf stable chapati, atta with multigrain/multi whole grains and online fortification of atta Whole wheat flour / Maida refined wheat flour (Shree Mahabir Foods Limited, Meghalaya)
- ◆ Production of atta, whole wheat flour - (Sri Rajalakshmi Traders, Bangalore)
- ◆ Virgin coconut oil (Green Aura International, Trichur; Harvika Food & Acqua Pvt. Ltd, Kerala; K3K Foods and Beverages Pvt. Ltd., Mandya)
- ◆ Shelf stable chapati (Avenue Trading Company, Calicut)

New Start-ups

Nutra-Phyto Incubation Centre & Central Instrumentation Facility (NPIC-CIF) has been operational in the CSIR-CFTRI campus since 2016. Details of two recent start-ups joined at NPIC are listed.

Dhriti Bio Solutions (DBS) has been established in response to a highly complex need: an integrative approach to Health, Nutrition & Environment Optimization. The vision of the company is solely research & development and to license out technologies and formulations as well as scaling

up engineering solutions. The innovations of the company include: Metamofs, Biopolymer, Waste to wealth and development of Nutritional Algorithms.

Sattvaponics, DIPP recognized start-up, work on solving problems with raw materials for the global nutraceutical and food ingredients industry through innovations in agriculture and post-harvest processing. The incubatee aims to develop plant-based protein powders with the improvements over existing protein such as better amino acid profile, Higher PDCAAS, better texture, higher traceability and free from allergens and any contaminants.

About the Company: Saredh Enterprises, Bangalore has been promoting Chia and Quinoa superfoods which are high in demand for their nutritional values and empowering farmers to grow these cash crops, supporting them with technical support to ensure high yield and high returns with minimal investment in terms of seed, water and labour costs.

Product ranges & brand: PRASUKH (a Sanskrit word) – food free from impurities is a brand name for the products made with Chia and Quinoa. We are researching on various products for the convenience, easy adaptability and consumption of these superfoods in everyone's diet. CFTRI is supporting us with technology. The product ranges include jams based on Chia such as Fig Jam, Mango Jam, Mango Chilli Jam, Mango Mint Jam, Mango Ginger Jam, Pineapple Chilli Jam, Guava Chilli Jam, Apple Cinnamon Jam and Mixed Fruit Jam, Jam slices and Carbonated fresh fruit juice.

Vision & Challenges: To exceed the expectations of our clients and to form partnerships with them. To



deliver exceptional value and service to end customers. To be innovative and to think long term in strategizing and planning a healthy next generation.

As Chia and Quinoa seeds are new, we faced challenges in customer awareness, hence we started educating the customers about the health benefits of Chia and Quinoa seeds.

Role of CFTRI in catalyzing growth of your firm: CFTRI has played a major role in catalyzing growth of our firm, right from the base, the agrotechnology, our products technology are all from CFTRI. CFTRI is a one stop for all our food needs, we think of an innovative product and CFTRI helps us with the technology. We are happy to be associated with CFTRI.

Your advice to emerging start-ups: Set the goals and focus on even the minute opportunity that you get to grow.



New Collaborations

National Institute of Engineering, Mysuru (Nov. 11, 2019)

The scope of the MoU include creating human resources ability (students, research scholars and faculty) through skill development programs and advanced research cooperation in areas of mutual interest; improving research and academic standards through unique programs; working on related R&D initiatives in society with respect to artificial intelligence and machine learning.



Food and Biotechnology Consultancy Services (FOBICS), Mysuru (Nov. 11, 2019)

Both the organizations have agreed to work together to provide Industry / Entrepreneurs with various services in the area of food processing in terms of process development, scale-up,

technology transfer and other customised requirements.

Ten on Ten Mentoring & Advisory Services (Tenon10), Hyderabad (Nov. 21, 2019)

The aim is to promote and foster entrepreneurship in the food processing sector through the establishment of incubation centres, customer financial advice and EDPs.

Stonefield Flavours Pvt. Ltd., Bengaluru (Nov. 22, 2019)

The collaboration is meant for strengthening R&D efforts to incorporate innovative flavor components into new generation food products and marketing.



New Facilities

Fruit Ripening Facility

Fruit maturation is a natural physiological process that occurs through ethylene production, a natural plant hormone. Since natural ripening takes a longer period for the climatic fruits, the vendors on the market use calcium carbide to ripen most of the fruits artificially. This artificial maturation produces acetylene that is reported to be carcinogenic, causing allergic reactions and posing health hazards as well. The new fruit ripening facility will facilitate the ripening of fruit using ethylene under controlled conditions. It will be boost to carry out research and development, training of farmers and entrepreneurs.



Happenings

NSQF aligned skill development programme on post-harvest technologies

During Nov. 4-29, 2019, the CSIR-CFTRI conducted a 4-week NSQF aligned skill development program on post-harvest fruit and vegetable technologies. This course is conducted in accordance with the guidelines of the National Skill Development Corporation (NSDC). The course offered hands-on training of various fruit and vegetable products in the processing, production and quality aspects. The course consisted of two modules, the first module focused on the fresh fruits and vegetables, modern post-harvest operations to reduce losses during handling, transportation and enhance shelf life. The second module focused on fruit and vegetable processing into pulps, juices, drinks, canned products, dehydrated products, pickles, jams, etc. The candidates were awarded NSDC

certificates in Qualification pack: Supervisor - Fruits & Vegetables Processing (FIC/Q0109; NSQF level 5). A total of 21 participants attended the programme.

Important Visitors / Delegations to CFTRI

APEDA delegation visited CSIR-CFTRI on Nov. 6, 2019 and held discussion with scientists.

Events

India International Science Festival (IISF) Curtain Raiser event (Oct. 12, 2019)

The Curtain raiser event of IISF was held on Oct. 12, 2019. Dr. Harsh Vardhan, Hon'ble Minister of S&T, MoES and Health & Family Welfare released IISF brochure and addressed the media about the event. He also had a glimpse of CFTRI products and visited the incubation facility.



CSIR-CFTRI Foundation day (Oct. 21, 2019)

Dr. S. Ayyappan, Former DG, ICAR, delivered Foundation Day address and distributed Annual Institute awards. An MoU was signed between CSIR and YES Bank on this occasion. Industry meet on Food Processing (CSIR-YES bank initiative) was held in which a total of 25 Industries participated.



Vigilance Awareness week (Oct. 28 - Nov. 2, 2019)

Chief Guest of the function Sri. J.B. Rangaswamy, Retd. Deputy Suptd. of Police, Mysore addressed the gatherings and distributed prizes to staff and school students.



Kannada Rajyotsava Day (Nov. 1, 2019)

Kannada Rajyotsava on November 1, 2019 and Kannada Habba Inaugural event was held on November 6, 2019, in conjunction with Kannada Sahrudaya Balaga. Prof. Krishna Gowda and

Mr. Mohan Varnekar were the Chief Guests of the function. Dr. Raghavarao KSMS, Director, CSIR-CFTRI presided over the function.



Workshop on "Technology & Value Added Food" for farmers (Nov. 25, 2019)

The workshop was organized by Kannada Sahrudaya Balaga on Nov. 25, 2019. The event was inaugurated by Dr. KSMS Raghavarao, Director, CSIR-CFTRI and Shri M.H. Nagaraj, Joint Director, Dept. of Horticulture, addressed the participants. Ahara Vignana Magazine was launched on the occasion.



User awareness training program on Web of Science (Nov. 21, 2019)

User awareness training program on Web of Science and EndNote was organized on Nov. 21, 2019. The program was aimed at encouraging the optimal use of e-resources and enabling users to

Happenings

use this analytical tool in their research workflow in a more effective manner. Mr. Jaswanth Jenny, Senior Solution Consultant, Clarivate Analytics conducted the training where about 75 students and staff members actively participated.

JIGYASA (Nov. 27-28, 2019)

Scientist-student connect program, JIGYASA was held during Nov. 27-28, 2019. A total of 83 students and 10 teachers from 3 Govt. schools participated in the event and interacted with scientists.



Short-term courses (Jan. – Feb. 2020)

- ◆ Laboratory requirements towards accreditation to ISO 17025: 2017 standards (Jan. 06-10)
- ◆ Potential of marine natural products for food and biomedical applications (Jan. 06-10)
- ◆ Chromatographic based analytical techniques to ensure food quality and safety issues (Jan. 13-17)
- ◆ Basic microbiology techniques and hygienic practices for entrepreneurs of food industry (Jan. 13-17)
- ◆ Genomic, proteomic and metabolomics approaches for the functional validation of nutraceuticals (Jan. 20-24)
- ◆ Sensory analysis-an approach towards consumer preference (for students & research scholars only) (Jan. 27-29)
- ◆ Rice milling, parboiling of paddy and value addition to rice (Feb. 03-07)

Selected Publications

- ◆ Bhavya M.L., Umesh Hebbar H., Sono- photodynamic inactivation of *Escherichia coli* & *Staphylococcus aureus* in orange juice, *Ultrasonics Sonochemistry*, 2019, **57**, 108-115. (IF: 7.279)
- ◆ Kuneit L., Kurrey N.K., Anu Appaiah K.A., Rao R.P., Probiotic yeasts inhibit virulence of non-albicans *Candida* Species, *mBio*, 2019, **10(5)**. (IF: 6.747)
- ◆ 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, *Carbohydrate Polymers*, 2019, **222**, art. no. 115005. (IF: 6.044)
- ◆ Mehar J., Shekh A., Nethravathy M.U., Sarada R., Chauhan V.S., Mudliar S., Automation of pilot-scale open raceway pond: A case study of CO₂-fed pH control on *Spirulina* biomass, protein and phycocyanin production, *Journal of CO2 Utilization*, **33**, pp. 384-393. (IF: 5.189)
- ◆ Tavanandi H.A., Vanjari P., Raghavarao K.S.M.S., Synergistic method for extraction of high purity Allophycocyanin from dry biomass of *Arthrospira platensis* and utilization of spent biomass for recovery of carotenoids, *Separation and Purification Technology*, 2019, **225**, 97-111. (IF: 5.107)

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